CANADIAN PUBLIC HEALTH JOURNAL

DEVOTED TO PREVENTIVE MEDICINE

VOLUME 28 — **September, 1937** — NUMBER 9

Symposium on Anterior Poliomyelitis

Academy of Medicine, Toronto

Present Incidence in Ontario. Virus and Experimental Infection. Epidemiological Features. Symptomatology. Difficulties in Prognosis. Nasal Spraying. Convalescent Serum Therapy. Surgical Treatment.

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Detecting Residual Gonococcal Infection

R. J. GIBBONS

Bilateral Artificial Pneumothorax

H. A. JONES

Co-operation in Local Health Work

CARL E. HILL

PUBLISHED MONTHLY BY THE

Canadian Public Health Association

105 BOND STREET, TORONTO, ONTARIO

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CANADIAN PUBLIC HEALTH JOURNAL

VOL. 28, NO. 9 SEPTEMBER, 1937

Symposium on Anterior Poliomyelitis*

PRESENT INCIDENCE OF POLIOMYELITIS IN ONTARIO

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Chief Medical Officer of Health for Ontario

DURING the first six months of 1937 there were thirteen reported cases of poliomyelitis in the province of Ontario. The number of cases reported each week since July 3rd is shown in figure 1.

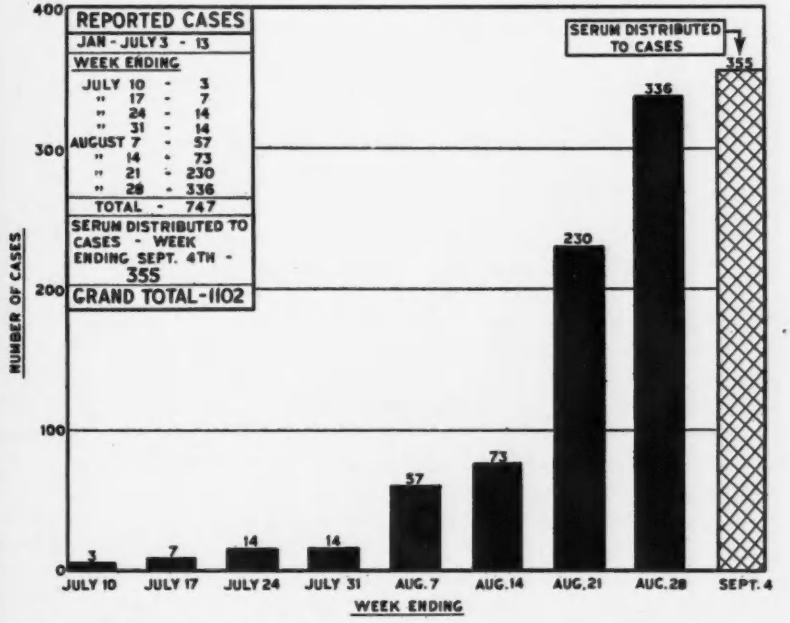

FIG. 1.—Reported Cases of Poliomyelitis by Weeks, *July 3-September 4.*

**Presented at a special meeting of the Academy of Medicine, Toronto, September 7, 1937.*

Beginning with the first week in August there was a very abrupt and rapid increase in the number of cases. Whether or not this increase is now reaching its peak cannot yet be stated with confidence.

No machinery exists for day-by-day reporting of communicable diseases by all municipalities, such data being forwarded weekly to the Department. It has been necessary, therefore, to compute the number of cases at any given time by supplementing the reported figures with the known distribution of the serum.

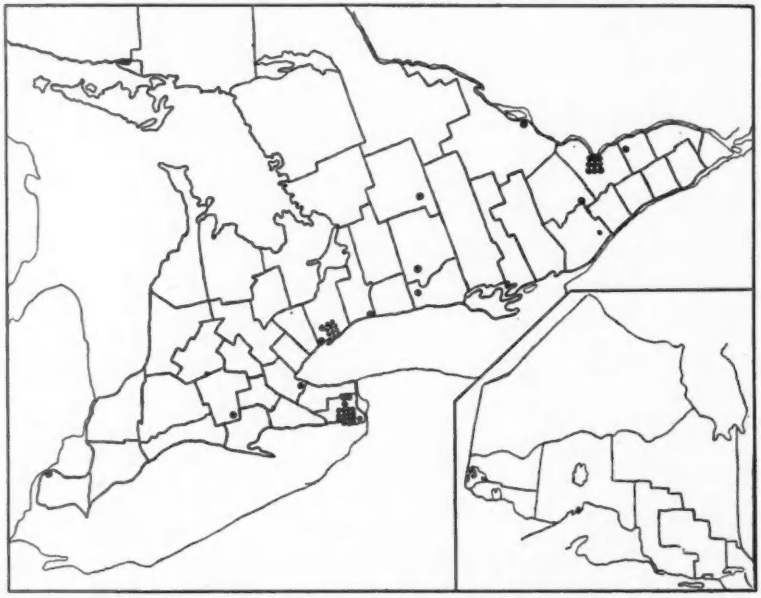

FIG. 2.—Poliomyelitis in Ontario, *January 1-July 31.*

The figure for the last week shown in figure 1, that ending Saturday, September 4th,* therefore does not refer to reported cases. It does, however, represent the number of persons who are known to have received poliomyelitis serum during that week. Our experience indicates that this represents a reliable but somewhat conservative estimate of the number of cases which will later be reported. The apparent slackening in the rate of increase suggested by the table may not be verified when complete reports have been received.

To the end of August this year we have had a total of 747 reported cases of poliomyelitis in the province. This incidence is more than ten times as great as for comparable periods in non-epidemic years. In comparison with 1929, when the disease was prevalent in Ontario, there have been seven times as many cases up to the end of August. In comparison with 1930, when the most extensive previous outbreak occurred, there have been three times as many cases for the corresponding period.

**At time of publication of this article the number of cases reported to the end of September 4th was 1,135.*

Geographical Distribution

The geographical distribution of reported cases of poliomyelitis from January 1st to July 31st, 1937, is shown in the accompanying map (fig. 2).

From this map it is evident that, until the end of July, reported cases were mainly concentrated in three areas: southern Niagara Peninsula, Toronto district and Ottawa. The majority of cases reported late in 1936 also occurred in these three areas.

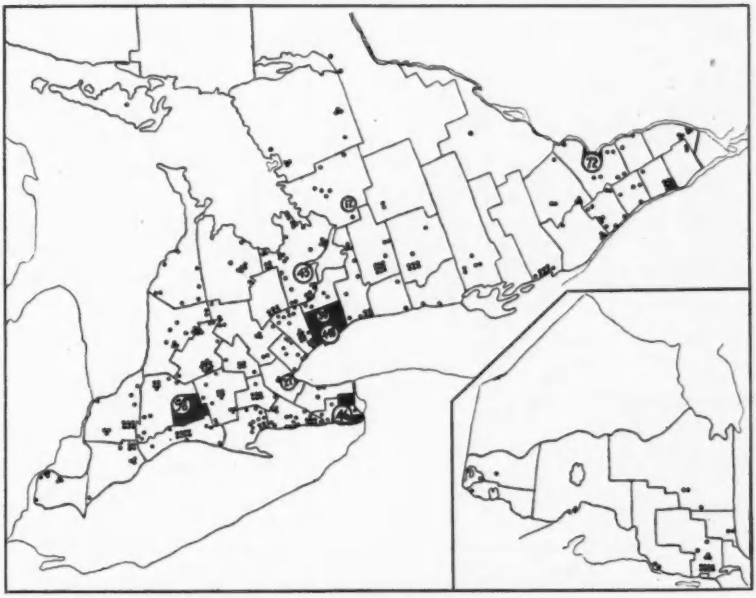

FIG. 3.—Poliomyelitis in Ontario, *August 1-September 4.*

The rapidity of spread from these three centres is shown in figure 3, giving the geographical distribution of cases for the month of August.

Some idea of the speed and direction of spread may be gained from the following dates. To the north, cases were first reported in upper York county and Barrie by August 7th; in Muskoka by August 21st; and in Parry Sound by August 28th. To the west, cases were first reported in Norfolk, Elgin, Wentworth and Middlesex by August 14th; in Huron, Bruce and Grey by August 21st; and in Lambton by August 28th. In the eastern part of the province, no very extensive spread appears to have taken place outside of Carleton county until August 28th when the first cases were reported from Stormont. During the past week, Prescott, Dundas and Grenville have begun to be affected.

As indicated by regular reports up to August 28th and by serum distribution since that time, it is estimated that there have been approximately twelve hundred cases of poliomyelitis in the province to date this year.

The measures taken by the Provincial Department in an attempt to assist

the local authorities in the affected areas are but of casual interest to you and will, therefore, be but casually referred to.

In the districts in which the disease has shown an increase in the normal incidence rate, the Chief Medical Officer has met with the Medical Officers of Health and has discussed with them various aspects of the problem, such as quarantine, isolation, closing of schools and other places where children are

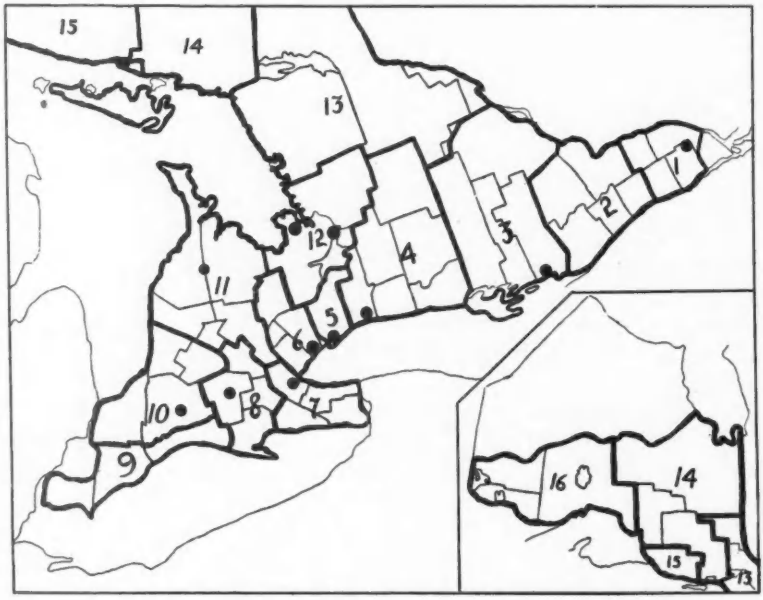

FIG. 4.—Consultation Service to Medical Officers of Health.

encouraged to congregate, hospitalization, serum distribution, collection and dosage, and suggested preventive procedures.

In an effort to assist in the early identification of cases of poliomyelitis, the Department has placed at the disposal of the Medical Officers of Health, in the districts shown, specially trained physicians to act as consultants in respect to this problem. The situation in northern Ontario is such that it has not yet been necessary to provide this service (areas marked 14, 15 and 16). All arrangements have been completed, however, and such provision can be made in a few hours if reports from the north should warrant such extension. The thirteen consultants already placed are being called upon by local medical officers to assist with problems as they arise.

The Department has placed at strategic centres respirators and is prepared to ensure rapid transportation to those centres of all cases showing evidence of involvement of respiratory muscles.

While one may hope that the present outbreak in Ontario may have reached its peak, there would appear to be no epidemiological support for any such inference.

POLIOMYELITIS: VIRUS AND EXPERIMENTAL INFECTION

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LANDSTEINER and Popper (1) were the first to produce poliomyelitis experimentally. At a medical meeting in Vienna in 1908 they demonstrated sections of the cords of two monkeys which had been infected with cord emulsion from a human case of poliomyelitis. The histological findings in the monkey cords were those of poliomyelitis and Landsteiner and Popper suggested that this disease might be caused by a virus. In November and December of the following year, a number of papers by independent workers —Flexner and Lewis (2), Leiner and von Wiesner (3), Landsteiner and Levaditi (4), and Römer (5)—reported success in serially transmitting the virus through a number of monkeys. Landsteiner and Levaditi (4), as well as Flexner and Lewis (6), also showed that the virus was filterable.

Recent determinations of the size of the virus show that it is one of the smallest viruses known, measuring 10-12 millimicrons* in diameter. It is resistant like most other viruses to glycerol and to 0.5 per cent. phenol. It shows some resistance to drying and freezing, and the majority of observers report inactivation of the virus by heating to temperatures greater than 55°C. The virus is readily destroyed by sunlight and by oxidizing agents such as 1 per cent. hydrogen peroxide or 2 per cent. potassium permanganate. The virus is also rapidly killed by chlorine in concentrations used in the chlorination of water supplies.

The monkey is the only animal known to be susceptible to poliomyelitis. It is noteworthy that relatively few strains of poliomyelitis virus have been carried in series through a number of monkeys since difficulties may be encountered in the establishment of some strains in this animal. The incubation period of poliomyelitis in the monkey is usually 5-11 days although it may be prolonged with attenuated virus. A preparalytic rise in temperature occurs, with restlessness or apathy and tremors varying from fine generalized to coarse intention tremors. Finally flaccid paralysis develops as a result of destruction of the anterior horn cells. In the monkey the virus is found in the central nervous system, more than 90 per cent. of the virus being located in the cord. Outside of the nervous system, it has been recovered from the naso-pharynx of monkeys inoculated by the intracerebral route. With exceptions referable to route of inoculation and dosage, the virus is absent from other tissues of the monkey. After intravenous inoculation the virus is localized by the spleen (Hudson, Lennette and Gordon, 7).

In man, apart from the central nervous system and ganglia, the virus has been recovered only from the upper respiratory tract. It has never been found in cerebrospinal fluid or blood. In 1911 it was first shown that nasal pharyn-

*1 millimicron $= \frac{1}{1{,}000{,}000}$ millimetre.

geal washings of human cases obtained either during the acute stage of the disease or after death contained virus. The total number of positive isolations from nasal and oral secretions and tonsils of living human beings, nevertheless, is small (Kramer, Sobel, Grossman and Hoskwith, 8). Eight positive results have been obtained from patients during the acute stage of the disease. Only four positive results have been obtained from convalescents, thirteen, sixteen and seventeen days, and four months, respectively, after the onset of illness. Only twice has the virus been isolated from the naso-pharynx of healthy contacts. In one instance, the virus has been isolated from tonsils and adenoids of a child without any history of contact with a case. However, it should be borne in mind that negative results with naso-pharyngeal washings do not indicate absence of virus from this situation, particularly since substances which inhibit the virus may be present in the nasal secretions of some individuals.

The susceptibility of the monkey to inoculation of virus by various routes is of interest in connection with the spread of poliomyelitis in man. Monkeys are highly susceptible to intracerebral or intraneural inoculation of virus and may be readily infected by intranasal instillation of the virus, particularly if the nose has been previously washed out with acid phosphate buffer solution (Schultz and Gebhardt, 9). Monkeys are relatively resistant to infection by other routes such as subcutaneous, intradermal and intravenous. Apparently they cannot be infected via the normal alimentary tract. A few successful feeding experiments are referable to contact of the virus with the nasopharynx. It is only possible to infect the monkey by the so-called alimentary route if the gut is clamped until the pinch reflex disappears or the inoculum is actually injected subserosally. Large amounts of virus placed repeatedly in healthy isolated loops of intestine will not cause infection (Hudson, Lennette and Gordon, 7).

The primary lesion in the monkey is the destruction of nerve cells directly by the virus, cellular exudation and interstitial inflammation being secondary to this destruction (Hurst, 10). Experimental work on the march of virus and lesions in the central nervous system along definite neural tracts (Fairbrother and Hurst, 11; Hurst, 12; Faber and Gebhardt, 13) strongly suggests spread of the virus along the axons and not via perineural lymphatics and other routes. This is a widely accepted view at the present time in spite of difficulties of reconciling such a spread of neurotropic viruses with certain physical factors apparently involved. It is at least definite that in the monkey the virus behaves as a strict neurotrope—an obligatory, intracellular parasite of certain types of nerve cell.

Although poliomyelitis virus is a strict neurotrope in the monkey, specific neutralizing antibodies appear subsequent to infection if the animal survives. These antibodies are similar to those which are found in the blood of many normal human adults as well as in the blood of recovered cases of poliomyelitis. When poliomyelitis virus is mixed and incubated with serum containing these neutralizing antibodies it is inactivated and does not produce infection when the mixture is injected intracerebrally into a monkey. However, with the activity of poliomyelitis virus restricted to nerve cells in the monkey, it is not to be

expected that humoral immunity, i.e., immunity due to circulating antibody, can play any significant part in restraining the virus once it has penetrated nerve tissue. This is borne out by experimental work in the monkey. Serum is of little value in prophylaxis (Schultz and Gebhardt, 14) and none in treatment of the experimental infection (Schultz and Gebhardt, 15). If a monkey recovers from an attack of poliomyelitis, it becomes resistant to further inoculation of the virus. This resistance to re-inoculation, however, precedes the appearance of neutralizing antibody in the blood of the animal. On the other hand, monkeys inoculated with killed poliomyelitis virus develop neutralizing antibody without concomitant immunity of the central nervous system (Sabin and Olitski, 16). In spite of the presence of neutralizing antibody in their blood, they are not resistant to intracerebral or intranasal inoculation of the virus. So far monkeys have been immunized against poliomyelitis only when preparations containing living virus are administered by routes of low infectivity (Kramer, 17).

The most important point about the virus and the experimental disease in the monkey is that the virus is an obligatory parasite of certain nerve cells and has no affinity for any other type of cell or tissue in this animal. Amoss has remarked: "There is no experimental disease which so clearly reflects in its clinical aspects the human analogue as does experimental poliomyelitis." Certainly, as far as the infective changes in the central nervous system are concerned, this statement is true. However, one of the most important problems of poliomyelitis in man is whether in the human infection the invasiveness of the virus is restricted to certain types of neurones. According to Draper, "acute poliomyelitis is an acute infectious disease in the course of which paralysis is but an accidental and incidental occurrence." More recently Faber (18) has extensively discussed the view that in man as well as in the monkey the virus is a strict neurotrope, and he has interpreted the early symptoms of poliomyelitis in terms of infection limited to the central nervous system. Frankly, I do not think that there is sufficient evidence to allow us to choose between these views.

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SOME EPIDEMIOLOGICAL FEATURES OF POLIOMYELITIS

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IN any discussion of our present knowledge of the epidemiology of poliomyelitis, the physician seeks an answer to the following questions: First, is the disease communicable? Second, what are the sources of infection in the community? And third, how is the disease transmitted?

Is the Disease Communicable?

Although the disease had been recognized as a clinical entity through studies of many observers, it was not described in epidemic form until 1881 when a small group of cases was investigated in Sweden. Although subsequently epidemics of larger size were recorded both in Europe and America, doubt was expressed as to the communicability of the disease. In 1905 Sweden was visited by a severe outbreak in which more than 1,000 cases were reported. This epidemic is remembered not only because of its seriousness but because of the great contribution of Ivan Wickman (1) in establishing the communicability of the disease. The epidemic afforded an excellent opportunity for an intensive epidemiological investigation since the majority of the cases occurred in rural areas, many in quite isolated places. Through careful study of the families in which cases were reported, Wickman showed that many members suffered from a mild illness without the development of later paralysis. These he described as abortive cases of poliomyelitis. He also proved that healthy persons in contact with cases often harboured the virus. Wickman collected such a volume of evidence through his painstaking investigations that, although the cause of the disease had yet to be demonstrated as a living agent, the communicability of poliomyelitis was proved. Three years later independent investigators in New York and Vienna demonstrated that the cause of the disease was a virus by inoculating monkeys with material from fatal human cases and producing the disease. The demonstration of the virus corroborated the conclusions of Wickman and the occurrence subsequently of many serious epidemics has left no doubt that poliomyelitis is a communicable disease.

What Are the Sources of Infection in the Community?

Human beings are the source of infection. Wickman's studies established this fact and showed how the distribution of the cases corresponded to the lines of man's travel. Although it is seldom possible to relate cases definitely with other recognized cases, the fact that there are many mild or abortive cases and that healthy persons may act as temporary carriers makes it possible to explain the occurrence of widely separated cases. None of the lower animals except the monkey has been found to be susceptible to the disease and there is no evidence that domestic animals may be carriers of the virus.

It is known that the virus is present in the nose and throat secretions of persons actually ill with the disease or those who may be temporarily harbouring the virus. This has been established by inoculating susceptible monkeys with suitably prepared washings of the nose and throat. It is obvious that the demonstration of the presence of the virus by this method is difficult and it is not surprising that, in a recent review of the subject, Kramer, Sobel, Grossman and Hoskwith (2) state that the virus has been isolated on only fifteen occasions from the nose and throat secretions of living human beings. From ten persons it was recovered during or prior to the acute stage of the disease and from four during convalescence. From two persons in contact with the disease the virus was recovered eight and ten days after exposure. The virus was also recovered from the tonsils and adenoids of one child who gave no history of contact. The many failures to demonstrate the virus in the naso-pharynx in man may be due to some defect in the technique employed, particularly as it is known that frequently the normal secretions of the nose and throat contain substances which inactivate the virus. It is possible that the virus may be present in the faeces and urine. Convincing laboratory evidence is, however, lacking. The possible presence of the virus in the excreta warrants proper disinfection. The virus has not been isolated from the blood of human cases at any stage of the disease.

How is the Disease Transmitted?

The present conception of the disease is that of a widespread infection. For every case having paralysis there are many mild cases without paralysis. Since the virus has been isolated from the nose and throat secretions of cases and close contacts, transmission by contact is by far the most likely method of spread because of the ease with which the secretions of the nose and throat are transferred from person to person. The fact that the disease occurs in epidemic form during the summer months, whereas epidemics of scarlet fever, diphtheria and other common communicable diseases transmitted by contact occur in the winter, renders it difficult to explain fully the spread of the disease by contact. Further, the incidence of poliomyelitis is often higher in rural areas, and frequently in cities the congested areas do not show a higher rate than the less crowded residential districts. The weight of the evidence, however, supports strongly the view that contact is the most important avenue of transmission.

Although many of the cases manifest gastro-intestinal symptoms at the time of onset of the disease and the disease appears in epidemic form during the summer months, little evidence has been obtained experimentally to suggest that the virus enters through the gastro-intestinal tract. Numerous feeding experiments have been made and large quantities of active virus have also been introduced directly into the intestinal tract of monkeys without infection occurring. Only in experiments where the gut has been seriously damaged has infection followed. There is little evidence to suggest that the disease is transmitted by milk or water. The incidence of the disease in municipalities where milk is

efficiently pasteurized and the water supply chlorinated cannot be explained by such transmission, as the pasteurization and chlorination processes destroy the virus. The possible transmission by biting insects was early investigated. Although an initial success with the stable fly was reported in 1912, subsequent trials have given negative results. Recently the possible role of mosquitoes was investigated but no evidence was obtained to suggest that these insects are a factor in the transmission of this disease.

Other Etiological Factors of Interest

From many studies it appears that the incubation period is from three to twenty days, commonly from seven to fourteen days. The period of infectivity is not definitely known. As previously mentioned, the virus has been recovered from only four patients during convalescence, namely, from three in 13 to 17 days and in one after 4 months. In cities more than 90 per cent. of the cases occur in children under 10 years of age. In country districts a smaller percentage of cases occur in this age-group, so that possibly 20 per cent. of the cases are found in the age-group of 15 years and over. The mortality is lowest in the age-group 1 to 5 years. With advancing years, the case fatality rate tends to rise. It is for this reason that the mortality rate is usually higher in rural areas than in cities, since there are more cases in the older age-groups in the country. It has been generally observed that the disease more frequently occurs in males than in females, the proportion being five to four. The occurrence of two or more cases with paralysis in one family is relatively uncommon. However, if mild cases are recognized, multiple cases in the family are often found. Until clinical knowledge permits of more definite identification of early cases, and there are further advances in laboratory studies, many of the epidemiological problems must remain unsolved.

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SYMPTOMATOLOGY

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ACUTE anterior poliomyelitis does not offer any difficulty in diagnosis when paralysis is present. During recent months there has been an infection prevalent in the city of Toronto and throughout the province of Ontario. Numerous cases of paralysis have been reported. However, there have been many cases without any physical signs of paresis or paralysis.

The observations on the symptomatology or outstanding clinical symptoms of this present infection are briefly summarized.

First Stage

During the early stage of this infection, sudden in onset, the temperature varies from 100° to 101° F., seldom any higher. The young child complains of a "sore head", while the older patient is definite about having a headache. Feeling tired or drowsy, the patient is willing to go to bed. A feeling of soreness or aching in various muscles of the body may be noted. The gastro-intestinal disturbance is mainly that of vomiting, refusal of food, and constipation. Diarrhoea has been very unusual. The vomiting is not persistent, occurring once or twice during the first twelve hours. The "cold in the head" is mild, the nasopharynx showing some general congestion. A few of the patients complain of discomfort when swallowing, caused by slight inflammation of the fauces.

First Stage

Symptoms	*Outcome*
Fever 100-101° F. Headache or sore head. Drowsiness. Desire for bed. Muscle soreness.	Recovery without any further signs or symptoms.
Gastro-intestinal disturbance: Vomiting. Refusal of food. Constipation.	Apparent recovery but after 7-10 days signs appear of difficulty in swallowing; facial paralysis.
Respiratory infection: Cold in head. Sore throat.	1-2 days, appearance of second stage.

This clinical syndrome is the systemic reaction of a toxaemia or acute general infection. Occurring during the months of July, August and September, when acute anterior poliomyelitis has been prevalent, it is reasonable to assume that it represents the general reaction of the body tissues to invasion by the virus of this disease. Recovery without any further clinical signs or symptoms occurs in many cases within two to seven days from the onset. There are a few

cases where the onset has been gradual and the symptoms indefinite in type. After seven to ten days, when recovery seems apparent, the patient complains of some difficulty in swallowing or a facial paralysis is noted.

SECOND STAGE

Within one to two days the infection progresses and gives rise to a different clinical picture with a definite symptomatology. The facial aspect—wide-open eyes, flushed cheeks and anxious expression—is that of fear. A coarse tremor or ataxia appears in the hands.

SECOND STAGE

Symptoms	*Outcome*
Facial expression.	Recovery without paresis or paralysis.
Tremor or ataxia.	Paralysis without fatal ending.
Muscle pain.	Paralysis with fatal ending.
Hyperaesthesia.	
Mental confusion.	
Stiffness of neck.	
Rigidity of spine.	
"Spine-sign".	
Reflexes.	

The patient avoids any bodily movements and resents being handled, crying when this is attempted. This is due to muscle pain and hyperaesthesia. Delirium and convulsions are rare but mental confusion is commonly present. A variable degree of stiffness of the neck with rigidity of the spine is readily demonstrable. When the patient is placed in the sitting posture, the combination of the two latter signs produces the "spine-sign" (fig. 2). The reflexes do not show any definite changes. The symptomatology of this second stage is indicative of invasion of the central nervous system by the infection.

SPINAL-FLUID EXAMINATION

Acute anterior poliomyelitis without paresis or paralysis cannot be diagnosed without the aid of a spinal puncture. The spinal fluid during the first stage described is normal. The spinal fluid of the second stage has a variable increase in the cells and a positive globulin content (Pandy test).

TYPICAL CASE HISTORIES ILLUSTRATING STAGE I AND STAGE II

First Stage

A.L., age 5 years. Sudden onset. Ill for 24 hours. *Symptomatology*: fever 101° F.; headache, vomiting, drowsiness, soreness in legs and lower regions of back, slight sore throat. Examination: no stiffness of neck or rigidity of spine; "spine-sign" absent; no Kernig's sign; reflexes normal; cranial nerves normal; congestion of throat and pharynx without any post-nasal discharge; other systems normal. Spinal fluid: clear; 6 cells and globulin negative (Pandy test).

FIG. 1.*—Normal child.

Second Stage

J.S., age 3 years. Gradual onset. Ill for 48 hours. *Symptomatology*: drowsiness, fever; vomited once or twice; asked to go to bed; bowels have not moved for 2 days; neck hurts. Brought to hospital. Examination: face flushed; looks frightened; cries when being examined; stiffness of neck and rigidity of spine; Kernig's and Brudjunski's signs positive; reflexes unchanged; no muscle weakness or paralysis found; congestion of the fauces and pharynx; temperature 103° F. (rectal). Spinal fluid examination: cell count 90; globulin positive (Pandy test). Given 25 cc. convalescent serum and admitted to hospital.

FIG. 2.*—Spine sign. Child cannot put head on knees.

**From "Poliomyelitis in the Preparalytic Stage with a Discussion of Treatment", O. N. Torian and Matthew Winters, J. Ped., 1932, 1: 326.*

DIFFICULTIES IN PROGNOSIS

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DURING an epidemic of poliomyelitis there occur fairly well defined types of the disease. It may be of interest to review two clinical types which are commonly seen in the present outbreak. The following case histories illustrate the different courses that individual patients may take during the course of their illness.

CASE No. 1

N.B., age 9 years, female, admitted August 18, 1937. The history revealed that during the course of three days prior to admission, it was noted that the patient vomited, became drowsy and had difficulty in talking and swallowing. On admission, physical examination revealed a well nourished and developed child who did not appear acutely ill. On neurological examination she showed a coarse tremor of the hands and had some difficulty in speaking and in swallowing. The cerebrospinal fluid showed the presence of 40 cells with a preponderance of lymphocytes. The child was given 50 cc. of convalescent serum intramuscularly. She was discharged from hospital on September 8th, and no paralysis could be detected. This patient illustrates a mild type of bulbar poliomyelitis with complete recovery.

CASE No. 2

R.S., age 10 years, male, admitted August 3, 1937, with the following history: During a period of five days prior to admission, the child had suffered from headache, fever, and vomiting, and had complained of soreness of the muscles of the neck and legs. On admission the child appeared to be moderately ill and an examination showed the presence of meningeal signs and some difficulty in breathing. There was found to be paralysis of both legs and the left arm, weakness in the right arm, and intercostal muscles. The left biceps, the triceps, abdominal and both patellar reflexes were absent. The cerebrospinal fluid showed the presence of 320 cells, 70 per cent. lymphocytes. He was given 50 cc. of convalescent serum intramuscularly on admission. He failed to improve and became progressively worse during the next four days. His respirations increased, the gag reflex was lost, the patient developed difficulty in swallowing and died August 7th. This patient illustrates a type of bulbar poliomyelitis which was progressive.

CASE No. 3

G.H., age 3 years, female, admitted July 31, 1937, with the complaint of fever, headache, soreness of the neck, arms and legs. These symptoms developed during the course of the five days prior to admission. On admission the child was noticed to be acutely ill and drowsy, and a weakness of the left arm was

observed, although the left biceps reflex was present. The cerebrospinal fluid showed 36 cells with 30 per cent. lymphocytes. She was given 50 cc. of convalescent serum intramuscularly on admission. When re-examined in the clinic on August 23rd, she had still the same amount of weakness in her left arm. This case is one of a mild paralytic type with no recovery to date.

CASE No. 4

R.C., age 6 years, male, admitted to hospital September 6, 1937, with a history of fever, headache, anorexia and pains in the legs for one day and a half prior to admission. On physical examination September 6th, he presented signs of meningeal irritation and some slight weakness of the left arm. The cerebrospinal fluid showed the presence of 60 cells, 90 per cent. lymphocytes. He was then given 50 cc. of convalescent serum intramuscularly. This dose was repeated September 7th. Two days after the first dose of serum a more marked weakness of the left arm was noted and a paralysis of the bladder developed. On September 12th, it was noted that both legs and both arms were paralyzed. The back and abdominal muscles also became quite weak. This patient presents the picture of progressive paralysis involving both arms and both legs.

In an analysis of these cases the outstanding feature in the patients 1 and 2 is the fact that although both presented bulbar symptoms, one child made a complete recovery; the other developed a progressive paralysis and died. In the patients 3 and 4 paralysis was present in both on admission. In one the paralysis did not become more extensive, but in the other it continued to progress, involving both arms and both legs. Such clinical variations in the disease in different children make it very difficult for the physician to offer a prognosis as to the course of the disease in any patient.

NASAL SPRAYING AS A PREVENTIVE OF POLIOMYELITIS

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THE following are the facts on which the present nasal-spraying procedure is based:

(1) Anterior poliomyelitis is caused by a virus.

(2) Instillation of the virus into the nose of monkeys after their nares have been washed with a mild acid solution frequently results in the development of typical signs of poliomyelitis.

(3) Intracranial section of the olfactory bulb prevents in many instances the development of poliomyelitis in monkeys when the virus is instilled into the nares. This would indicate that the probable path of entry of the virus into the central nervous system is by way of the olfactory nerves.

Armstrong and Harrison (1) reported in May, 1935, that when twenty-

four monkeys were treated intranasally with a 4 per cent. alum solution followed by the instillation of poliomyelitis virus, 74 per cent. survived. Of twenty control animals not given the alum treatment, only 16 per cent. survived. It was also found that the onset of the disease was delayed and that the disease ran a slower course in the alum-treated group than in the control group. These findings were interpreted as evidence of a decreased permeability of the mucous membrane of the nose in the alum-treated group. The findings of Armstrong and Harrison were soon confirmed by other investigators.

Various other chemicals were rapidly investigated and in February, 1936, it was reported by Schultz and Gebhardt (2) that picric acid had a very high protective action. Similar results were also reported by Armstrong and Harrison (3).

At this stage of the investigations, an increased prevalence of poliomyelitis occurred in Alabama and Manitoba, and in both the spraying of the nose was done with a mixture containing 0.5 per cent. solution of picric acid and of alum in normal saline.

The experience with the picric acid-alum spray in the summer of 1936 in Alabama was reported this year by Armstrong (4). It was shown that the situation there had soon got out of hand and that the spraying was done in a most promiscuous manner with ordinary atomizers. It is obvious that if the spraying solution is to do any good it must reach the olfactory nerves high up inside the nose on the cribriform plate. Peet and his associates (5) this year have shown that it is almost impossible to reach this area unless a long special tip is used and the tip is inserted along the septum above the middle turbinate by either a nose-and-throat specialist or one thoroughly familiar with this type of work. It is obvious therefore that no figures of any value can be expected from the Alabama situation of last summer.

During the past year Schultz and Gebhardt (6) continued their investigations on the effect of spraying with different solutions and reported in June that they had tested the protective value of no fewer than forty chemical agents. They announced that:

> "Out of the array of substances which we have tested, there is one, namely zinc sulphate, which because of its simple composition, relatively low toxicity and surprisingly high protective action in monkeys seems to deserve a trial in man. . . . . More than 240 animals have now been treated intranasally with different concentrations of zinc sulphate in solution administered a varying number of times and at different intervals of time, and the resistance of these test animals has been compared with a total of nearly 300 untreated controls."

They briefly summarize their results by saying that two or three successive intranasal sprays with a 1 per cent. solution of zinc sulphate in normal saline will generally protect all or nearly all of the animals so treated against virus administered one month after the treatments have been given. About 90 per cent. of the control animals developed the disease. A higher degree of protection and a more lasting protection was obtained than with the picric-alum solution. Pontocaine, a local anaesthetic, was added to make the solution less irritating. Eight

monkeys were given a single intranasal spraying with zinc sulphate and pontocaine in normal saline and were subsequently subjected on seven occasions to virus instillations twenty-five to thirty-two days later. Of these, seven survived while all eight controls became infected.

Naturally the efficacy of this zinc sulphate solution has yet to be determined in human beings. This can be done only during the presence of an increased number of cases and, as brought out in the Alabama situation, only when the spray is administered high up in the nose by a nose-and-throat specialist or one thoroughly trained in this type of work. An attempt is now being made in Toronto to obtain information as to its possible value by observing a group of approximately 5,000 children.

On August 29th the problem of undertaking such a study was presented to the nose-and-throat departments of the following hospitals: Toronto General Hospital, Toronto Western Hospital, St. Michael's Hospital, the Hospital for Sick Children, Mt. Sinai Hospital, St. Joseph's Hospital, Toronto East General Hospital, and the Women's College Hospital. I should like to take this opportunity to express on behalf of the Departments of Health of the Province and the City, of the School of Hygiene and the Hospital for Sick Children, our thanks for the most remarkable way in which the nose-and-throat specialists of this city are co-operating in this investigation. The Department of Health of the Province has made a grant to cover the expense of the study. Dr. Gordon P. Jackson, Medical Officer of Health, Toronto, has given every co-operation through his department. The School of Hygiene, University of Toronto, has been responsible for such important aspects of the study as selecting the size and age-constitution of the group to be sprayed as well as the control group, installing records and carrying out the arrangements for clinic appointments, etc. This work has been most efficiently carried out by Dr. Mary A. Ross under the direction of Dr. R. D. Defries.

A report in detail of this study will, of course, be made later. However, a few observations may be of interest at this time. The otolaryngologists who conducted the clinics can tell you better than I of any difficulties that they may have encountered in administering the spray. I understand, however, that they feel that unless there is some anatomical deformity of the nose they are able to apply the spray to the olfactory area in a satisfactory manner in practically every case. Very few ill effects have been noted. Most of the children sneeze and have some temporary discomfort. Vomiting, headache and stiffness of the muscles of the neck have been reported in a few children. Peet and his associates record the temporary loss of smell following the application of the spray in many children. Every child sprayed has been given a card stating that temporary discomfort might be expected and that, if there was any occasion to call a physician, to telephone and a physician would attend. In all, only forty-three calls have been made and in each instance by the time the physician arrived the child was improving and did not require special attention.

It is intended to provide a second spraying of this group of children in approximately two weeks' time. Subsequently, through the co-operation of

the Department of Public Health, Toronto, observations will be made of the group during the succeeding weeks and essential information collected. The follow-up work and the analysis of the results will be made under the direction of the School of Hygiene, University of Toronto.

One must remember that the value of this procedure is still to be determined and although there is excellent experimental evidence to justify its use, still, in the light of our present knowledge, it is not a procedure which should have official endorsement by the public health authorities. In the interval, whether private patients are sprayed or not is a matter to be decided by the patient and his physician.

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CONVALESCENT SERUM THERAPY

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PREVIOUS to 1927-28 the use of convalescent serum in the treatment of preparalytic poliomyelitis was based on, first, the demonstration in 1910 of neutralizing antibodies in the serum of monkeys and individuals recovered from the disease; second, the report in 1910 by Flexner and Lewis that intraspinal injection of serum within 24 hours after the inoculation of the monkey prevented paralysis or prolonged the incubation period; third, the encouraging reports and opinions based on various clinical trials, especially by Netter, 1911, 1915; Zingher, 1917; Draper, 1917; and Amoss and Chesney, 1917. Other trials, notably by Schwarz, Ulrich, Neal and Abramson, failed to substantiate the favourable reports. In 1927-28 a renewed interest in convalescent serum was manifested. Independent reports from widely separated places, Aycock and Luther in Massachusetts, Macnamara and Morgan in Australia, Netter in France, Shaw and Thelander in California, McEachern, Chown, Bell and McKenzie in Manitoba, presented apparently significant evidence of its value. These were supported by the report of Flexner and Stewart in 1928 that the intravenous administration of serum was effective in controlling experimental poliomyelitis in monkeys given the virus by the intracerebral route. From such extensive and widely separated clinical trials and the reports of its effectiveness in experimental poliomyelitis, the use of convalescent serum in the preparalytic stages or as a prophylactic in poliomyelitis appeared to have a reasonably satis-

factory basis. There were many, however, both clinicians and laboratory workers, who questioned its value.

In an effort to obtain what was hoped would be an answer to the question, experiments were conducted in Eastern United States (including New York) in which control cases, some of them alternate patients, were not given serum but were kept under observation. The analysis of the results failed to show that any route of administration of serum was superior to other routes or that the treated cases had any less paralysis or fatality than those not given serum. In other words, in these controlled observations evidence of the therapeutic value of serum was lacking. But it should be pointed out that, in discussing the subject in 1932, Aycock (1), one of those who made the control study, stated: "I feel from the standpoint of the patient that it still cannot be said that immune serum should not be given, but from the point of view of settling the question convalescent serum should, where possible or necessary, be given to alternate patients with the disease in the hope that finally a definite verdict may be reached." And Fischer (2), reporting the study made in New York City in 1931 under the auspices of the New York Academy of Medicine, concluded as follows: "We have demonstrated that the outcome for the treated patients was no better if as good as for the untreated ones; while the controls were probably somewhat milder we feel that no advantage was shown by the other group. For this reason, it should be possible in the future to obtain a sufficient number of control patients, for our present study has demonstrated that there is no proof that a physician is depriving his patient of an equal chance for complete recovery by not administering convalescent serum. Lacking a substitute therapeutic procedure, it would seem fair in subsequent epidemics to retest the value of potent serum in the preparalytic or meningitic stage of poliomyelitis, using, if possible, exactly parallel or alternate cases for control. If this is impossible, at least comparisons should be made as to the outcome for treated and untreated patients using as a basis the day of the disease, the symptoms and other factors such as those discussed in this report."

Many physicians basing their opinions on observations in patients given serum before the onset of paralysis were not convinced by these reports of the lack of value of serum. Question, too, has been raised in regard to the method of selection of controls and quality of serum used in some of the controlled observations referred to. Conflict of opinion hinges largely, of course, on the limitations of diagnosis and prognosis in preparalytic poliomyelitis.

Since that time reports both favourable and unfavourable have been published, and critical and very extensive analyses of all the available data have failed to give an unequivocal answer to the problem. The most recent report (3) is that of the use of serum in the severe outbreak of poliomyelitis in Manitoba last year. In this Dr. F. W. Jackson, Deputy Minister of Health and Public Welfare of Manitoba, presents strong evidence of its value as shown by definitely less paralysis and lower fatality rates in those who were given serum. He emphasizes again the importance of the early administration of the serum in

adequate quantity. He states: "I do not believe there is a physician in Manitoba who used serum last fall but would testify to the definite clinical improvement following its use." In referring to the evidence presented he says: "These findings are, of course, subject to the criticism that, in view of the limitations of the diagnosis of early cases, not all the cases included were actual cases of poliomyelitis." It is evident in the report, however, that every effort has been made in the presentation of the data to control this factor as much as possible.

Confusing the picture still more are the later findings in experimental poliomyelitis in the monkey. There is now considerable evidence that, in monkeys, virus given intranasally enters the body through the nerve endings in the nose and spreads along the neurones. If this portal of entry and means of spread applies to human beings, a hypothesis which is still but a hypothesis, there would appear to be but little opportunity for serum to come into contact with the virus and check its progress in the central nervous system.

Further, the experimental observations which, at the time reported, strongly supported the use of convalescent serum might now be subject to different interpretations.

The conflicting evidence therefore does not permit of any final decision regarding the value of convalescent serum in the prevention of paralysis. Such evaluation must await the development of more definite diagnostic criteria, laboratory or clinical, a better understanding of the nature of the disease in man or a clinical trial with control cases under conditions which would leave no room for doubt.

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THE SURGICAL TREATMENT OF POLIOMYELITIS DURING ITS EARLY STAGES

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THE surgical treatment of anterior poliomyelitis should begin with the appearance of the paralysis and is directed toward the maintenance of the paralysed or paretic muscles in a neutral position. If muscles whose innervation has been disturbed are permitted to be stretched either by the action of uninvolved opponent muscles, or by gravity, etc., two complications arise: firstly, the muscle is rendered unable to function when the innervation returns and, secondly, changes in the capsules and ligaments around a joint occur which fix the joint in an improper position. It is therefore imperative, where maximum recovery of function is to be had, to institute immediately on the appearance of paralysis measures to keep involved muscles relaxed. To accomplish this splints or other devices must be used.

It is well known that recovery of muscle power begins in some cases within ten days of the initial involvement, but in others recovery may not occur for six months or more. It is important that muscles just beginning to contract are not overworked. It may be stated after due consideration that no patient who has muscular weakness as a result of poliomyelitis should be allowed out of bed before six months have passed, and most cases may require nine months or a year. It is desirable in view of this long period of recumbency to have the patient placed at once on a Bradford frame, a gas pipe rectangle filled in with heavy canvas laced to the pipe. No pillows or cushions are to be permitted, and the patient lying flat on his back may be carried around in the house or out. To the frame may be added, as the individual cases require, the particular splints. If there be weakness of one or both deltoid muscles, an adjustable arm splint may be clamped on to the frame and the arm maintained at the angle of abduction required (90 degrees). Similarly, weakness in the arm and forearm and hand may have appropriate splints added. The lower extremities when on a frame require no splinting except what is put on the leg and foot, the foot to be kept at a right angle and the leg midway between inward and outward rotation. Weakness of the muscles of the back and the abdomen is suitably treated by the patient's lying flat on the frame.

In order that suitable splinting may be instituted early, it is found that simple measures will suffice until regular splints can be obtained. A board should be placed under the mattress to keep the surface flat, no pillows should be allowed, and if there be weakness of the shoulder muscles a bandage from the elbow to the head of the bed secures the arm at 90 degrees from the trunk. Blocks, books, etc., can be so placed between the patient's foot and the foot of the bed to hold the foot at 90 degrees at the ankle if there be weakness permitting toe drop.

Splinting will have to be maintained until recovery occurs to a degree sufficient to permit of useful function. If no recovery of sufficient degree occurs, fitting of braces or stabilizing of joints must be the ultimate procedure.

Massage should not be employed while there is superficial or deep tenderness in the extremities. Pain is not often present after the third week, and massage may then be employed. It is useful in assisting the circulation of blood in the inert muscle and in this way in maintaining the muscle in good condition. It must not be combined with movements devised to promote muscle training. Muscle training should not be undertaken until recovery is well marked, and even then is not to be indulged in to a degree where fatigue occurs.

The tank treatment is a fairly recent method of giving muscle training. It does this in an adequate fashion, but care must be taken that patients are not introduced to underwater gymnastics before they have well-developed power, as it is felt that too early movement of a recovering muscle may very seriously retard its progress. The tank is a fine psychological agent in the treatment of a patient during the stage of recovery. There is no reason to assume at the present time that any of the modern forms of electrical treatment bear any rela-

tion to the recovery of nerves and the development of muscle. In the past there has been a great deal said about electrical treatment. It is fair to say that in no well-known clinic is there any use made of electrical treatment in any of its multifarious forms.

The splints that are most frequently needed in the treatment of acute anterior poliomyelitis are the arm abduction splint and the leg splint. These

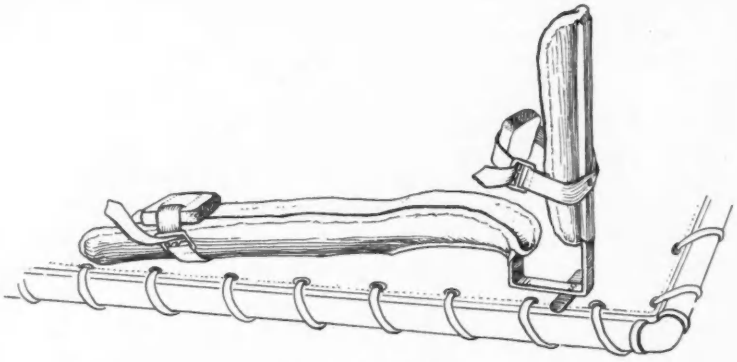

FIG. 1.—Leg Splint.

splints are now being made at the Hospital for Sick Children, Toronto, in enough different sizes to fit any child, and of a type that can be provided without any complicated measurements and in which minor adjustments can be easily made. These splints are available and can be supplied if the necessary measurements are provided. Bradford frames are also available and can be obtained in the same way.

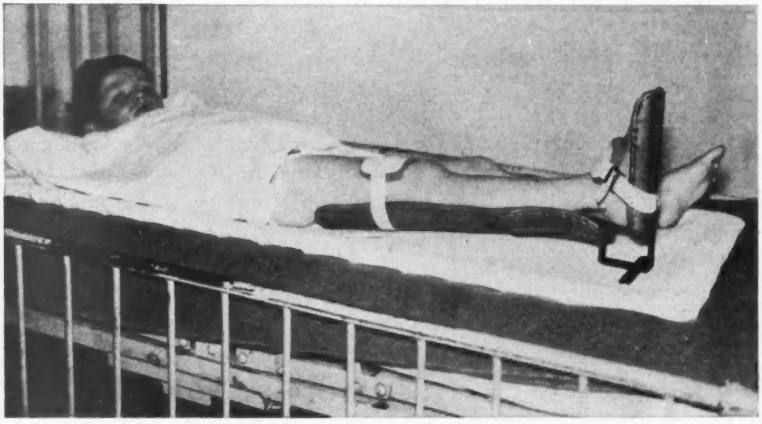

FIG. 2.—Leg Splint Applied to Patient on Bradford Frame.

The Bradford frame should be about a foot longer than the patient and about eight inches wider. The size does not need to be at all accurate and, in most cases, on ordering a frame, only one measurement is necessary, that is the height of the patient. One exception to this is when the child requires an abduction splint on each arm. For such a patient the width of the frame is important, and in addition to the height of the patient, one other measurement is necessary, the width of the patient across the shoulders (fig. 3).

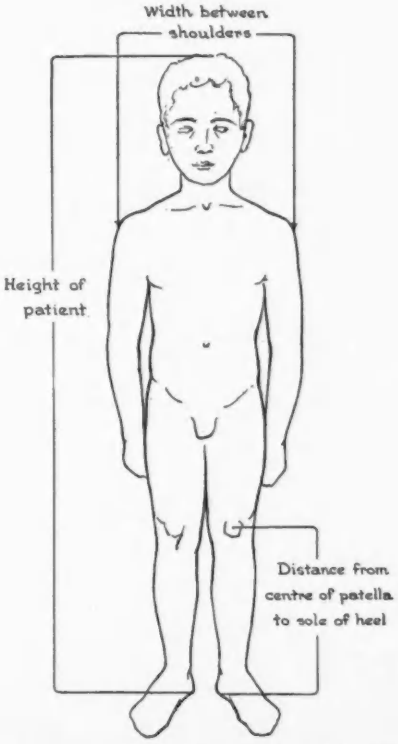

FIG. 3.—Measurements necessary for ordering splints. For Bradford frame, the height of the patient. When double arm abductor splints are needed, the width of the patient between the shoulders. For leg splints the distance from the centre of the patella to the sole of the heel.

The leg splint is intended to hold the knee extended and the foot dorsiflexed to a right angle, and to prevent rotation at the hip in either direction (figs. 1 and 2). These splints are made in different sizes, and in ordering a leg splint only one measurement is necessary, the distance from the centre of the patella to the sole of the heel (fig. 3).

The arm abduction splint is intended to hold the shoulder abducted, the

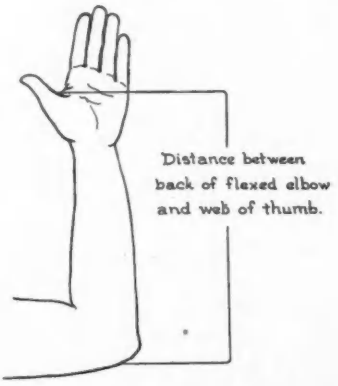

FIG. 4.—Measurements necessary for ordering splints. For the arm abduction splint, the distance from the top of the flexed elbow to the web of the thumb.

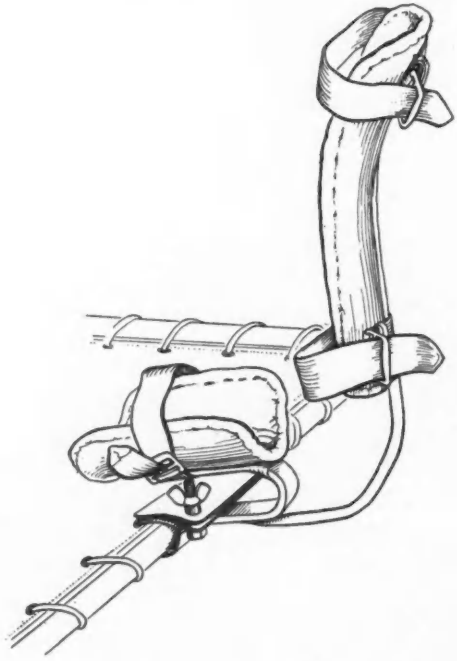

FIG. 5.—Arm Abduction Splint Clamped on Bradford Frame.

elbow flexed to a right angle, the forearm supinated, and the wrist extended (figs. 5 and 6). It is clamped to the pipe forming the side of the Bradford frame and cannot be used without the frame. To order a single arm abduction

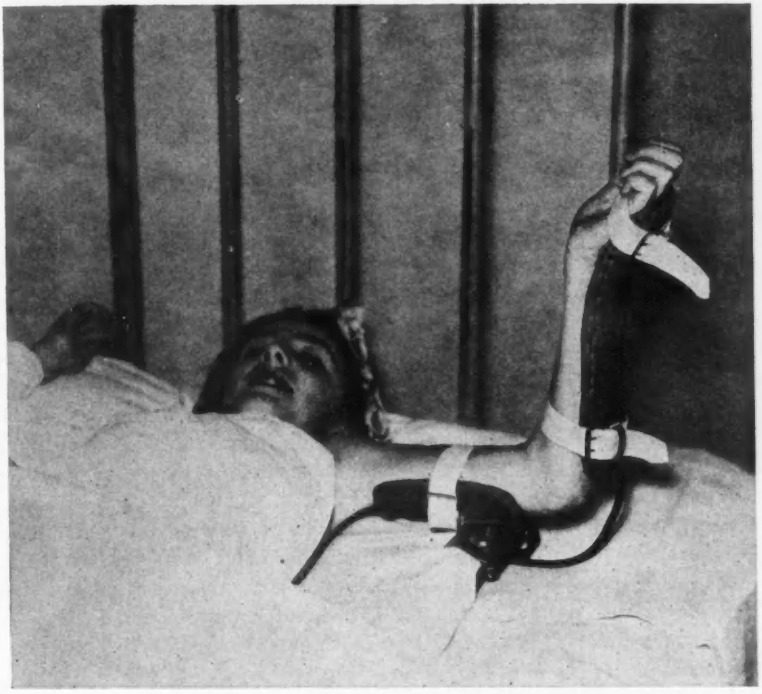

FIG. 6.—Arm Abduction Splint Applied to Patient.

splint only one measurement is necessary, the distance between the tip of the flexed elbow and the web of the thumb (fig. 4). If both arms require abduction splints a further measurement is necessary, the width of the patient across the two shoulders (fig. 3).

CONCLUSIONS

1. Every case of muscle weakness or paralysis following poliomyelitis should be placed on a Bradford frame.

2. Six months is the minimum period of recumbency. Some cases may require eighteen months or longer.

3. Suitable splints are to be worn if required on extremities.

4. Massage is to be commenced when it is not uncomfortable for the patient.

5. Muscle training is to be begun only after the patient has shown definite and considerable recovery in power.

Bilateral Artificial Pneumothorax in the Treatment of Pulmonary Tuberculosis*

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THE use of artificial pneumothorax in the treatment of pulmonary tuberculosis has become so established that it is attempted in the majority of unilateral lung lesions. The presence of a moderate amount of disease in the contralateral lung is no deterrent. Indeed it has been gratifying to observe that the latter frequently improves when the more seriously involved lung is effectively collapsed. On the other hand there may be an extension of the disease on the uncollapsed side. In recent years bilateral pneumothorax has been increasingly used and largely in these cases where extension has occurred contralaterally. In the recent report of Corsello and Bruckheimer (1) 25 of their 36 cases originally had unilateral pneumothorax and were subsequently converted into bilateral pneumothorax because of extension of disease already present in the contralateral lung. Bilateral pneumothorax is also available where there is unilateral pneumothorax and a new focus has developed in the previously lesion-free contralateral lung. Section or interruption of the phrenic nerve may be preferred in such cases, but in the absence of early favourable results by this method of treatment, bilateral pneumothorax is advisable. O'Brien (2) definitely advocates phrenicectomy or phrenic crushing rather than pneumothorax on the contralateral side when the disease is slight or cavity small.

Probably the most spectacular results are obtained where both lungs are more or less equally involved and bilateral pneumothorax is the ordained method of treatment from the beginning. Until comparatively recently the presence of a moderate-sized cavity in each lung, even though a large part of the remaining lung tissue was unaffected, usually rendered the patient ineligible for active treatment. Such treatment was deferred in the hope that one side would heal sufficiently to permit of collapsing the other at a later date. Usually this did not occur. Where cavitation exists in one or both lungs, expectation of life is comparatively short without some form of collapse. Barnes and Barnes (3), in a study of 1454 cases with cavity, estimated the average duration of life to be 15 months. Cavities do heal spontaneously but, as pointed out by Marvin and Pollock (4), the number is insignificant. Bilateral pneumothorax definitely improves the prognosis of patients with moderate involvement of both lungs and, to an even greater extent, those with bilateral cavities. All degrees of

*Presented at the Thirty-sixth Annual Meeting of the Canadian Tuberculosis Association, Vancouver, B.C., June, 1936.

success are met with from mere prolonging of life to complete arresting of the disease. In the former the lessening of toxaemic symptoms by a partially successful bilateral collapse alone justifies the treatment. In some, success may be achieved only on one side but, if the progress of disease is temporarily halted on the other, a thoracoplasty can be done on this side at a future date.

No precise rule can be followed in selection of cases for bilateral pneumothorax. Considerable experience in the use of unilateral pneumothorax together with appreciation of the indications of phrenic operations, pneumolysis, thoracoplasty and oleothorax is essential. Age, racial origin, distribution and character of the lung lesion, vital capacity and condition of the cardio-vascular system are all determining factors. Cutler (5) states that "if the disease is advanced in the two lungs to the extent that 50 per cent. or more of the total lung tissue is destroyed, pneumothorax will produce little or no effect and may be said to be contra-indicated". He also states that "patients with definite hypertension—180 mm. or more—do not as a rule do well under pneumothorax therapy". Carman (6) states that patients over 40 years of age are usually unsuitable subjects because of the failure of the cardio-respiratory system to compensate as well in older persons. Further, he disapproves of the performing of bilateral pneumothorax when the vital capacity is below 2000 cc. Corsello and Bruckheimer found that cases with caseous pneumonic lesions responded poorly.

Most writers agree that periods of observation before active treatment is instituted should be strictly limited. The elimination of toxaemia as soon as possible should be the objective. Occasionally a short period of bed rest before collapse therapy is commenced is beneficial. In cases with unilateral pneumothorax and a moderate amount of disease in the contralateral lung, it is difficult sometimes to decide whether or not immediate collapse of the latter would be advantageous. Not infrequently there is a temporary improvement followed shortly, however, by rapid spread, often to the point of cavitation. The time lost in not inducing bilateral collapse may, in addition to the possible spread of disease, allow of formation or thickening of pleural adhesions. Where the unilateral pneumothorax is only partially effective, there is less likelihood of the diseased contralateral lung improving. Phrenic nerve interruption or pneumothorax on this side should be employed early.

Results in 36 Cases

In a review of our present series of 36 cases it is evident that many would have been better treated had the contralateral lung been collapsed earlier. Twenty-two patients developed cavitation contralaterally during the course of unilateral pneumothorax, before being converted into bilateral pneumothorax. However, it should be pointed out that during this period many times the number of cases having unilateral pneumothorax and having contralateral lung involvement improved to the point not requiring bilateral collapse. But there is no ground for undue optimism that a diseased contralateral lung will progress to permanent healing. Where this does take place, an unnecessarily long period

of bed rest is required. If the patient is being treated in an institution, the management of bilateral pneumothorax is not much more difficult or embarrassing to the patient than unilateral pneumothorax. Since the treatment is well tolerated in most instances, the complications not unduly troublesome, and the prognosis better with effective collapse than without collapse, any delay in converting a unilateral pneumothorax into a bilateral would not seem to be in the best interests of the patient. There are undoubted exceptions to this principle. In some cases the distribution and character of disease are such that phrenicectomy or phrenic crushing on the contralateral side is preferable. In instances where the contralateral lung involvement is very slight, or where a moderate lesion exists that has apparently been inactive for a considerable period of time, no urgency for active treatment exists on this side.

We feel that a wider application can be made of oleothorax. In the few instances where we have had an oleothorax on one side and a pneumothorax on the other, the treatment has been well tolerated. With oil, collapse can be maintained more easily at a constant level and refills are required only at long intervals. After the oleothorax is established the conduct of the case is essentially that of a unilateral pneumothorax. An oleothorax-pneumothorax combination may then be an improvement over bilateral pneumothorax in a selected small proportion of cases.

The age distribution of the 36 cases of bilateral pneumothorax was as follows: 15-19 years, 10 patients; 20-29 years, 22 patients, and 30-42 years, 4 patients. Twenty-eight were females and 8 males. In 25 patients bilateral pneumothorax was performed following a unilateral pneumothorax. In the remaining 11 bilateral pneumothorax was first undertaken. In 35 of the cases the sputum was positive and cavities were present in both lungs. Phrenicectomy was performed on 6 patients and was helpful in 3. Pneumolysis was not available but undoubtedly would have improved the results. Pneumothorax has not been induced in any of these patients during the past year.

The technical procedure has been essentially the same as in unilateral pneumothorax. Intrapleural pressures are kept negative where possible but frequently it has been necessary to use positive pressures in order to stretch pleural adhesions. When the bilateral collapse is well established, intervals of refills have varied from one to three weeks. Except in a few instances, where collapse has been rather extensive, dyspnoea has been surprisingly absent.

Twenty-four of our 36 cases had pleural effusion in varying degree. The majority of these have been transudates and have required no aspiration. Only one pneumothorax was seriously affected by an adhesive pleuritis. Four had a tuberculosis empyaema but in each this complication was successfully treated by substituting an oleothorax. The germicidal agent used was 5 per cent. Gomenol in olive oil. One of the four patients subsequently died following a bronchial fistula. In the fifth case, in which following an effusion the pleural space showed a tendency to be obliterated, an oleothorax was substituted. One per cent. Gomenol in olive oil was used and the result was very satisfactory.

One patient had a series of spontaneous collapses on the left side and one

on the right side within two months of induction of bilateral pneumothorax. At one time air was more or less constantly removed on the left side for 144 hours. Refills were discontinued on this side when it became necessary to convert the right pneumothorax into an oleothorax because of a tuberculous empyaema. A year later this patient was quiescent with negative sputum.

Nine of the 36 patients are dead. Four had progressive disease with ineffectual collapse, and two were complicated with intestinal tuberculosis. One of these had an effective bilateral collapse with negative sputum. One was complicated by an exophthalmic goitre, which was removed; however, the pneumothorax was only partially effective. One oleothorax case died following development of a bronchial fistula on that side. In 16 of the 36, pneumothorax has been terminated and in 11 bilateral pneumothorax has been continued. Considering the group of 16 in which pneumothorax has been terminated, 14 are sputum-negative and 2 sputum-positive. Nine cases may be considered as arrested, 5 as quiescent, and 2 as unimproved. Of the 11 in which bilateral pneumothorax is being continued, 6 are sputum-negative and 5 sputum-positive. Seven of the cases may be considered quiescent, 3 as improved, and 1 as unimproved.

TABLE I

TIME ELAPSING IN 9 CASES SINCE RE-EXPANSION OF LUNGS

Case	*Right Lung*	*Left Lung*	*Condition of Patient*
1	1½ years	3½ years	Resumed occupation
2	2½ "	1 year	" "
3	1½ "	3 years	" "
4	4 "	4 "	" "
5	4½ "	2 "	" "
6	1½ "	2½ "	" "
7	1 year	1 year	" "
8	4 years	1½ years	Unable to work
9	3 "	Oleothorax	Working

From the results outlined, it is evident that great benefit has been derived from the use of bilateral pneumothorax in this series of cases with bilateral cavitation. Without its use the prognosis in these cases would have been extremely poor. Nine patients have already resumed work and the expectation for recovery in 12 others appears excellent.

CASE I

S.H. White, female, graduate nurse, age 22. Sputum positive, right lung infiltrated to the 3rd rib and soft looking. Cavity 4 x 4 cm. in upper lobe. Left lung lightly infiltrated to the 2nd rib level. Right pneumothorax induced July 8, 1931. Adhesions prevented effective collapse but progress of disease seemingly arrested. Right phrenicectomy performed in April 1932. Cavity closed June 1932. Left pneumothorax induced March 1933 following development of cavity 1.5 cm. in diameter at first rib level. Fair collapse but adhesions prevented a selective collapse. Cavity at first became larger (3 x 3 cm.), but was finally obliterated about March 1934 in the course of which an effusion developed. Tuberculous empyaema resulted a few months later and by September 1934 had been converted into an oleothorax with 5 per cent. Gomenol in olive oil. This has been maintained since with only occasional small refills of oil. Sputum became negative

in January 1934 and has remained so since that time. Patient has been ambulatory for nearly a year. She has been doing light work for the past six months and is now able to return to full-time work. Because of the large collapse required on the left side the right lung was re-expanded in June 1933. The original large cavity was accordingly only effectively collapsed for one year. Nevertheless in the three years that have since elapsed, the right lung has remained essentially clear.

CASE II

H.Mc. White, housewife, age 42. Admitted August 1932 with low grade fever, productive cough, positive sputum. History of two years' duration following right-sided pleurisy. Two moderate sized cavities at 2nd and 3rd rib levels on right and one 2.5 x 2.5 cm. opposite second rib on the left. Right pneumothorax induced August 10, 1932 and left pneumothorax a week later. Adhesions on both sides prevented complete early closing of cavities. All three cavities closed by March 1933. Sputum negative since. Patient ambulatory. Both lungs allowed to re-expand in October 1935 and appeared fairly clear. Discharged eight months ago and continues in excellent health.

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Co-operation in Local Health Services*

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THE rapid extension of public health work makes it extremely important that we should consider critically the work which we are doing, appraise the effectiveness of procedures, discard the less useful and take up, with greater vigour, those tasks which promise a larger return for money and effort. The public is more interested in what it receives from its public health department than in its organization. One sometimes has the impression, though, that the medical officer of health who quietly prevents or controls an outbreak of communicable disease receives less credit for his timely efforts than the medical officer who gives wide publicity to his efforts and incurs a large expenditure of public funds in combating an outbreak, particularly when the outbreak might have been prevented by closer attention.

Be that as it may, we are united in the objectives of our campaign against death and disease. We are sure of its place and importance in the growth of our nation. It is my firm belief, and yours, that public health work must be supported because of its human significance. We can by the effective doing of our task inspire the nation with a similar conviction.

If we are agreed on what needs to be done to achieve our objectives in improving public health, we should seek the closest co-operation of the practising physician. In any question relating to medicine or to public health in general, the family physician is the family adviser. Irrespective of how much propaganda or educational work which may be carried on respecting any public health measure, the expressed opinions of the practising physicians will have an important bearing upon the success of the measure. The program of public health to-day can only be conducted successfully when the local health department is heartily supported by the medical profession and the work is conducted jointly by the department and the profession.

The foregoing is not new; it is a repetition of what public health officers have long known. Nevertheless the repetition may serve to emphasize the necessity for our whole-hearted co-operation with the practising medical, dental and nursing professions in any program for the maintenance of a proper standard of public health. Might I suggest that you urge your county medical society, of which there are 49 in Ontario, to set aside one meeting each year for the discussion and presentation of advances in public health. Medical officers of health can materially assist in the preparation and presentation of such a program.

Fortunate indeed is the municipality which enjoys the full-time services of

**Abstract of presidential address delivered at the Twenty-third Annual Meeting of the Ontario Health Officers Association, Ottawa, June, 1937.*

well-trained public health or school nurses. With the cheerful co-operation and enthusiastic assistance of the public health nurse, the part-time medical officer is able to initiate and carry forward work in a number of fields which otherwise would not be served. A conscientious public health nurse will include in her program prenatal services and services for the infant, preschool, and school child. She will be concerned also with communicable diseases and the furtherance of mental hygiene, the education of the public in health matters, and in social welfare.

We have all learned that in promoting community health it is not only a matter of discovering the conditions that need to be remedied but of the taking of definite steps to prevent or alleviate such conditions. It is not enough, through school medical inspection, to find physical defects in school children; the correction of these defects must be achieved. The first duty is to point out the defects and to urge that the family physician be consulted. If there is no family physician and if the family is unable to provide the necessary treatment, including glasses or remedial appliances, the department of health can be the agency for presenting such needs to the community. We are all familiar with the excellent work of the various service clubs and other philanthropic agencies which are willing to consider such special needs. Several of the service clubs are pleased to supply orthopaedic appliances, arrange for tonsillectomies, and to provide essential dental care. Some of the clubs have provided municipal wading pools or swimming tanks and have aided municipalities in providing supervised playgrounds with suitable equipment. The urgent need for eyeglasses has been met by various agencies and the branches of the Canadian Legion have been most helpful in meeting the needs of ex-service men's children, often supplying to children other essentials such as school books. The various women's organizations, such as the Women's Institutes and the Imperial Order of the Daughters of the Empire, take an active interest in maternal and infant hygiene and in many municipalities their assistance is making possible essential work in these fields. Home and School Clubs make available extra milk or hot lunches for malnourished children. The Red Cross Society, among its wide activities, provides layettes, extra milk for the sick, temporary bedside nursing care, and often medicines. Under the auspices of the Red Cross, home nursing classes, nutrition and cooking demonstrations, and vision, dental and underweight surveys are arranged.

Although it is not usual for the presiding officer of this association to make suggestions to the Department of Health, yet I believe that the following subjects are of such importance that this association might give serious consideration to them, and, if approved by the association at this meeting, might present them as definite recommendations to our provincial department:

1. That medical officers of health, particularly those serving part-time, would benefit greatly by having the opportunity to attend short refresher courses which, if possible, might be arranged at convenient and strategic centres. Such courses would permit an insight into the whole broad field of public health as well as giving the opportunity of becoming familiar with the recent advances

in immunology, in the control of communicable diseases, and other important subjects.

2. That the Ontario Medical Association be urged to set aside part of one day for a discussion of public health, particularly from the standpoint of the general practitioner, thus giving the opportunity for the strengthening of the relationship between the health officer and the practising physician.

3. That, appreciating the importance of the school teacher as a health instructor, every effort be made to further provision of special training for teachers in health, and that to this end the suggestion be made to the Department of Education of the payment of a bonus to those teachers having such special training.

4. That the Department of Health be respectfully requested to give consideration to the restoration of the former annual subsidy paid to municipalities as an aid in the employment of public health nurses.

5. That the Department of Health be urged to continue its efforts to establish some definite basis for the more equitable remuneration of medical officers of health than that which is at present provided in Section 52 of The Public Health Act.

These are but a few of the important problems which present themselves to your minds. Our annual meeting is the occasion when we can, in conference, discuss frankly our situation and we know that the Department of Health will welcome any recommendations which this Association desires to offer.

May I, in closing, remind you that it is our responsibility to make the annual meeting of the greatest possible value. It is ours and it is a privilege to attend. Suggestions will be welcomed by the Department in regard to future needs.

The progress of public health in our own municipalities is largely in our hands. If we can clearly see the problems which are most pressing, and if we can develop a practical program, we can with confidence appeal to our municipalities for the necessary support.

The Cultural Method for Detecting Residual Gonococcal Infection*

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THE cultural method of detection of gonococci in clinical cases of gonorrhoea has been demonstrated repeatedly to be very reliable, and has been frequently described as more efficient than direct-smear examination. The literature pertaining to gonococcal culture has been efficiently reviewed in a paper by McLeod, Coates, Happold, Priestley and Wheatley in 1934 (1), and in the report of the Committee for Survey of Research on the Gonococcus and Gonococcal Infections presented in 1936 (2). More recent publications by Leahy and Carpenter (1936) (3) and Josephson (1937) (4) corroborate the earlier reports. Since the costs and labour involved in this method are much greater than those entailed by smear examination, the practical value of the test, from the viewpoint of the public health laboratory, lies in its application to two particular groups of patients, namely, suspects from whom positive smears cannot be demonstrated, and patients clinically cured and presenting negative smears, for whom finer methods for the determination of non-infectiousness are desirable. The present study has been concerned with comparing the relative value of the two methods in these two groups, and with investigating certain conditions which may affect the efficiency of the cultural method.

The specimens examined in this survey were taken from patients attending the Provincial Board of Health Clinic in Vancouver. The majority of the specimens came from patients clinically cured, who were receiving routine tests to determine whether they might be discharged from the clinic. A small number of specimens was derived from new, suspect cases in which smear examinations had been negative. Duplicate specimens were taken from each patient, one being cultured and the other smeared. Specimens from females were taken from the cervix, and also from the urethra after squeezing out Skene's tubules. In males the fluid expressed by prostatic massage was taken for examination.

Technique

Each swab for cultural examination was immersed in a small tube containing about 2 cc. of infusion broth. Three plates were spread from each swab. One plate was spread immediately, and placed in a portable incubator at a

*Presented before the Laboratory Section at the Twenty-sixth Annual Meeting of the Canadian Public Health Association, Ottawa, June 18, 1937.

temperature of approximately 36°C. and the swab then replaced in its tube of broth. Specimens were then left at room temperature. After an interval of 2-3 hours for some of the specimens, and of 5-7 hours for the remainder, a second plate was spread. As soon as the second plate had been streaked, the swab was well agitated in the broth, then discarded, and the tubes were centrifuged at slow speed for five minutes. After decanting the supernatant broth, the sediment, presumably composed of the aggregated cellular elements containing phagocyted gonococci, was plated.

Medium

The culture medium employed was chocolate agar, consisting of 10 per cent. beef blood in a base of filter-sterilized beef infusion broth with 1.5 per cent. agar. McLeod's (1) modification of Wright's medium (in which the meat is infused in 1 per cent. peptone, and 0.2 per cent. basic sodium phosphate is substituted for sodium chloride), was tested as the nutrient base for the chocolate agar in a short series of cases. This medium was also tried in the laboratory using freshly isolated and old stock strains of gonococcus. McLeod's medium showed no advantages, and in some instances, when tested with freshly isolated strains, failed to grow the gonococcus, while media prepared with the routine, filter-sterilized base grew the microörganism. Other basic media for the preparation of chocolate agar were similarly tested, but no final conclusions as to their respective merits have yet been reached. A semi-synthetic medium which can be prepared at a fraction of the cost of infusion media has given very promising results.

The importance of an adequately moist medium for the growth of the gonococcus has been stressed by most of those who have experimented with this microörganism. Therefore in this work all plates were poured while the agar was quite warm to ensure an abundance of water of condensation, and the usual sterility test was omitted, the plates being seeded on the day of preparation. All cultures were incubated at 36°C. in an atmosphere of 12 per cent. carbon dioxide, and were examined after 44 to 48 hours' incubation.

The Oxydase Reaction

Plates which showed no obvious gonococcal colonies on direct inspection were tested by the oxydase reaction (5, 6), using a 1 per cent. aqueous solution of dimethyl-para-phenylene-diamine-hydrochloride. The dimethyl compound was used in preference to the tetramethyl since the former gives a sharper reaction, and is very much cheaper than the latter. The dimethyl compound has the disadvantage of a relatively higher toxicity for the gonococcus, so that if isolation of the culture for complete bacteriological identification is required, the tetramethyl compound is preferable. In aqueous solution the dimethyl compound develops a purplish discolouration within a few hours, and this interferes with the sharpness of the test. It therefore proved desirable to make up a fresh solution daily. The inconvenience of daily weighing out small

amounts of the reagent was overcome by preparing a 10 per cent. solution which was immediately dispensed in tubes in 1.0 cc. amounts and rapidly dried in the vacuum desiccator. Each tube thus contained sufficient reagent to make 10 cc. of a 1 per cent. solution. The desiccated powder redissolved readily, and supplied sufficient solution to test approximately ten plates. The solution was sprayed on the plates with an ordinary nasal atomizer. This method gave a more even distribution of the solution, required less time, and used less solution than the usual method of flooding the plates from a pipette.

A typical positive oxydase reaction involving a discrete gonococcal colony is a rapid colouration in and about the colony, which is first pink, then darkens to maroon, and finally becomes black, the whole reaction usually being complete within a few minutes. A second type of positive reaction was noted when certain plates were examined from 15 to 30 minutes later. Black or brownish-black spots were observed within obviously non-gonococcal colonies, although 5 minutes after addition of the reagent no change had been apparent. Careful picking and smear of samples from such areas of partial reaction often showed a few gram-negative diplococci in the midst of numerous bacilli or other cocci. This type of reaction is apparently due to very small gonococcal colonies which have been overgrown by the other microörganisms, but from which sufficient enzyme has been diffused to give a delayed, weakly positive test. Gram-negative diplococci have been found so frequently in colonies giving this type of reaction that if gram-negative diplococci are not found in smears from a colony giving the reaction, the specimen is reported as "suspicious", and a request made for further samples.

ANALYSIS OF RESULTS

In this survey, 521 specimens were examined from 348 cases, of which 186 were males and 162 females. The cultures were transported to the laboratory in a portable incubator whose temperature was maintained at 36°C. The smears, in accordance with the routine procedure of the clinic, were sent for examination to the Provincial Board of Health Laboratories in Vancouver. From 379

TABLE I

ANALYSIS OF POSITIVE CULTURES

Culture Positive					
Smear Positive		Smear Negative		Smear Suspicious	
Male	Female	Male	Female	Male	Female
6	20	33	52	2	1
26 (23%)		85 (75%)		3 (–%)	
114					

specimens, both culture and smear were negative. Positive cultures numbered 114, 21.9 per cent. of all specimens, positive smears 26, or 5 per cent. Among specimens yielding positive cultures, only 26, or 23 per cent., gave positive smears, while 85, or 75 per cent., gave negative smears. The sex distribution showed that of 72 females from whom positive cultures were obtained, 52, or 71 per cent., gave negative smears; while of 39 males giving positive cultures, 33, or 85 per cent., showed negative smears. In three instances—one female and two males—the culture was positive, and the smear was reported as suspicious. In 26 cases, 22 being females, the smears were negative; while the cultures gave the delayed weakly-positive oxydase reaction described above, and were therefore reported as suspicious. In three instances the culture was negative although the smears were suspicious. In two other instances the culture was negative and the smear positive.

As already described, after the first plating, swabs were returned to their respective tubes of broth, and held at room temperature. Certain of the swabs were replated after 2-3 hours, and others after an interval of 5-7 hours, with a view to determining the effect of delayed plating upon the incidence of positive cultures. The results were as follows:

In the group replated after 2-3 hours at room temperature, 51 specimens were positive on the first plate, and only 37 on the second; that is, 14, or 27.5 per cent. of the positive cultures were missed by the second plate. In the group replated after 5-7 hours, at room temperature, 41 specimens were positive on the first plate and only 26 on the second; that is, 15, or 36.6 per cent., of the positive cultures were missed by the second plate. In six instances the second plate was positive although the first plate was negative. In none of these instances were more than five colonies found on the second plate. Chance errors of sampling, when small total numbers of gonococci were involved, would fully account for the discrepancies between first and second plate findings in this very small group. Further analysis of the results given by these two groups (table II) shows that delayed plating not only led to a lesser incidence

TABLE II

NUMBER OF POSITIVE CULTURES MISSED IN RELATION TO DELAY IN PLATING

Time between plating first and second plates	Specimens positive on first plate	Specimens positive on second plate	Specimens negative on second plate
2-3 hours	51	37	14 (27%)
5-7 hours	41	26	15 (37%)
Totals.....	92	63	29 (31%)

of positive cultures detected, but moreover gave negative results in just those patients for whom a delicate diagnostic method is most required, namely those

whose infection was minimal, and whose smears were almost uniformly negative. Thus, of 22 specimens in which the first plate was positive and the second negative, 21 gave negative smears, and only one a positive smear: the average number of gonococcal colonies on the primary plates being five. On the other hand, among 63 specimens in which both plates were positive (the smear being positive in 20, and negative in 43), the number of gonococcal colonies was frequently too high to permit of accurate counting.

Josephson reported in 1936 that gonococci could occasionally be isolated from the sediment thrown down by slow-speed centrifugalization of the broth in which swabs had been thoroughly agitated, even when plates streaked directly from the swabs were negative. The technique was based on the supposition that the deposit should contain the aggregated leukocytes, with phagocyted gonococci, while many of the non-phagocyted secondary invaders would be discarded in the supernatant broth. Using this technique, a third plate was spread immediately following the second plating, and the efficacy of the method gauged by comparing the second and third plates. In one instance the gonococcus was isolated by this method when both first and second plates were negative. However, in 17 cases the third plate failed to grow the gonococcus although the second plate was positive.

During this survey cultures of non-gonococcal gram-negative diplococci were isolated on three occasions. Two cultures, from male cases, grew on plain agar and gave the carbohydrate reactions of *N. catarrhalis*. The third culture, isolated from a cervical specimen from a female case, grew on plain agar, but was not further classified. Such microörganisms may occasionally be responsible for false positive smears.

DISCUSSION

In this survey, the discrepancy between the smear and cultural methods is more marked than the figures given by other workers would lead one to anticipate: for in 76.6 per cent. of cases yielding a positive culture the smear proved negative. This discrepancy is no doubt due to the fact that the patients from whom specimens were taken represented a selected group. Most of those examined had given one or more negative smears before cultures were made.

The oxydase test proved an invaluable aid in the detection of positive cultures. But, to obtain the best results from the cultural method, it is important that specimens should be plated within a short interval after being taken. In this series, for instance, 27.5 per cent. of positive cultures were missed after the swabs had stood in broth at room temperature for only 2-3 hours. Again, a careful microscopic examination of smears from colonies showing the delayed weakly positive oxydase reaction often disclosed gram-negative diplococci in specimens which would otherwise have been regarded as negative. Furthermore, the occasional finding of positive cultures on the second plate, despite negative cultures on the first plate (attributed to errors of sampling from infected specimens), suggests that an additional slight increase in the efficiency

of the method might be brought about by spreading two or more plates from each specimen.

The cultural method is more costly and more laborious than smear examination, and its indiscriminate use would be unwarranted. However, the method is invaluable in detecting residual gonococcal infection in cases where clinical signs of infection have disappeared and smears have become negative; and no patient should be discharged as non-infective until negative cultures have been obtained. Cultural diagnosis could also be used to advantage in cases where gonococcal infection, though suspected, cannot be established by examination of smears.

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EDITORIAL SECTION

POLIOMYELITIS IN CANADA

THIS year will record the largest number of cases of anterior poliomyelitis that have occurred since this disease was made reportable throughout Canada. The information presented herein relates to the occurrence of the disease to September 18th. In Ontario the number of cases reported is 1,772, of which 561 were from Toronto. This incidence is more than ten times as great as for comparable periods in non-epidemic years. The largest number of cases previously reported in Ontario for an entire year was 671. This year, 157 cases have been reported in Manitoba, 145 in Saskatchewan, 76 in Nova Scotia, 64 in Quebec, and 55 in New Brunswick. No increase in incidence has been reported in British Columbia or Prince Edward Island.

As is characteristic of this disease, districts visited by an outbreak are seldom revisited for some years. Last year a severe epidemic occurred in the southwestern section of Manitoba. Of the 539 reported cases, only 82 occurred in Winnipeg, representing a case rate of 38 per 100,000 of the population, whereas in the centre of the area affected the rate was approximately 2,000 per 100,000. This year the disease is centred in the Winnipeg area. In previous years Saskatchewan has had a relatively small number of cases.

The mortality rate to date is low. In Ontario, 69 deaths have been reported, approximately 4 per 100 cases. The number, however, is not complete and it is quite possible that the mortality rate may be higher when corrected figures are available. In the Alberta epidemic of 1927, the case fatality rate was 15 and in the Manitoba outbreaks of 1929 and 1936, 9 and 6, respectively. The lower rate in Ontario during the present epidemic may reflect in part the results obtained by the use of mechanical respirators in the treatment of patients with respiratory involvement, a number of whom would have succumbed if such equipment had not been available.

Convalescent serum has been made available by each of the provincial departments of health for use in early treatment. In Ontario, serum has been provided for 1,561 cases and the collection and preparation of further serum supplies is being vigorously conducted.

It is, of course, too early for any definite statement to be made regarding the occurrence of paralysis. In the clinic at the Hospital for Sick Children, Toronto, one of the two diagnostic clinics available to physicians in that city, 1,273 patients have been examined to date; 523 were considered to be cases of poliomyelitis and of these, 150 presented evidence of paralysis.

In previous outbreaks in Ontario, Quebec, and Manitoba, the maximum number of cases was reported during the third week of September. The total number of cases therefore cannot be forecast.

PROBLEMS IN POLIOMYELITIS

OUR conception of poliomyelitis to-day is that of a disease which is widely distributed in the community at the time of an epidemic, evidencing the classical picture with paralysis in only a few persons but occurring in many individuals as a mild, transient infection. It is established that the disease is communicable. It is known that it is caused by a virus. It is believed that the most important avenue of transmission is through the contact of persons with other persons. Strong support for this is had in the demonstration of the presence of the virus in the nose-and-throat secretions through the successful inoculation of monkeys. Although these demonstrations have been made only on fifteen occasions, yet they have been sufficient to show that the virus is present during the acute stage of the disease and in convalescence and that it may be present also in the nasopharynx of healthy persons who have been in contact with the disease. The seasonal incidence of poliomyelitis, occurring as it does during the summer months, is suggestive of infection through the gastro-intestinal tract. Feeding experiments in monkeys, however, have given negative results and there is little experimental support for this route of infection. Similarly, the seasonal incidence is suggestive of the possibility of the transmission of the disease by flies or other insects. Here again, apart from an initial success in 1912, experimental work has signally failed to lend support to this theory. From observations in many epidemics which have occurred in cities it is now recognized that the distribution of the disease bears no relation to housing or to the economic status of the individuals affected. The less congested residential areas often show as many cases as the more crowded sections of a city. It is true also that there is frequently a greater incidence in the rural population than in urban centres. These facts present difficulties when the transmission of the disease is explained by contact. Further, the colder months of the year are the months in which "contact diseases" occur in epidemics. Despite these and other difficulties, the evidence to-day strongly supports the transmission of the disease through the transfer of the nose-and-throat secretions from person to person by fingers, droplet infection, and the use of articles used in common which have become contaminated with these secretions. The period of infectivity is not known. The virus has been isolated from three convalescent patients sixteen, seventeen, and eighteen days, respectively, after the onset of the infection. In one instance the virus is reported to have been recovered four months after

the onset. The incubation period also is not definitely known. From careful epidemiological investigations of isolated cases it would appear that the incubation period is from six to twenty days. Until these and other data are available, control measures must of necessity be of limited effectiveness.

Serious as is our present lack of information concerning the virus and the mode of spread of the disease, there is an even more serious lack of knowledge concerning its diagnosis before the onset of paralysis. In 1928 Aycock and Luther stressed certain signs and symptoms as affording the basis for the early diagnosis of this disease and urged the prompt administration of convalescent serum. Since that time many cases have been diagnosed as "early cases" and widespread use has been made of convalescent serum. The favourable outcome in many of the serum-treated cases has been generally attributed to its use. Supporting this interpretation are the reports of many physicians recording marked clinical improvement. On the other hand, reports of controlled observations have given no evidence that the serum is of therapeutic value. The present highly unsatisfactory state of our knowledge regarding the value of convalescent serum is due largely to our inability to definitely diagnose the disease before the onset of paralysis. Spinal-fluid cell counts are of assistance in diagnosis but it is known that an increased number of cells occurs in other diseases in which the prodomal symptoms are a counterpart of those which have been described as occurring in poliomyelitis. A most pressing problem, therefore, relates to the recognition of the disease in its early stages.

There is urgent need also for a clearer understanding of the nature of the disease in man. Draper early suggested that the disease was a general systemic infection with localization of the virus subsequently in the central nervous system. More recently, Faber, basing his opinion on experiments in monkeys, has advanced the view that the virus enters through the olfactory nerves, thus reaching directly the central nervous system. There does not appear to be sufficient evidence at present to permit of a choice being made between these two views. It is evident, therefore, that much experimental work must be done in monkeys, as well as more complete studies of pathological material obtained from human cases, before this essential question can be settled. It is with the background of these opposing theories that the diverse opinions regarding the possible value of convalescent serum must be interpreted. According to Faber's view there would be little opportunity for convalescent serum to be effective, whereas in the conception of the disease as presented by Draper the early administration of serum seems warranted.

Practising physicians, as well as those engaged in the investigation of the disease in the clinic and the laboratory, have the opportunity to make observations which may be helpful in solving the very evident problems which are presented by this disease. It is only by this concerted effort that the solution of some of the problems can be achieved.

REPORTS FROM THE ANNUAL MEETING*

Part III

THIRD ANNUAL REPORT OF THE COMMITTEE ON MILK CONTROL

THE Committee reports with extreme regret that its activities have been hampered by the untimely death of Mr. R. H. Murray, C.E., Director of the Division of Sanitation, Department of Public Health of Saskatchewan, whose efforts on behalf of a pure milk supply for every community have been more than a stimulus to the other members of this committee. Mr. Murray, at the time of his death, was preparing a third survey of the extent of pasteurization in Canada and had gathered additional data on outbreaks of communicable disease traceable to contaminated milk. To those who have been associated with Mr. Murray on this committee, his passing is a loss the extent of which at the moment is difficult to estimate. The findings of this survey are presented herewith.

Survey of Pasteurization in Canada with a Record of Epidemics Due to Raw Milk

In table I is given a list of milk-borne epidemics in Canada, with the number of cases and deaths. It is, of course, recognized that the number of cases given in this report, approximately 8,000, represents but a small part of the number of cases of these diseases which had their origin in infected milk. The epidemics recorded are those which were investigated by provincial or municipal authorities and with which milk was definitely associated. There are, in addition, other epidemics in which milk was undoubtedly an important factor in the transmission of the causative agent. These are not included in the data submitted. Further, the total number of sporadic cases of these diseases probably greatly exceeds the number included in the reported epidemics. The cases, however, of the known epidemics and the toll of deaths, 688 in number, give ample evidence of the inherent dangers of unpasteurized milk. Almost without exception these epidemics have been due to unpasteurized or improperly pasteurized milk. The latter aspect of pasteurization is receiving increasing attention. Only by the use of proper equipment, adequate supervision, and the conduct of the process by competent operators can pasteurization be considered satisfactory.

Survey of Pasteurization in Cities in Canada with over 20,000 Population

In supplying information concerning the extent of pasteurization in the larger cities of Canada, the medical officers of health have estimated the quantity of milk pasteurized in their communities. The number of pasteurizing plants has also been given. These data are presented in table II.

**Presented at the Twenty-sixth Annual Meeting of the Canadian Public Health Association, Ottawa, June, 1937.*

TABLE I

EPIDEMICS FROM MILK-BORNE DISEASE IN CANADA AS RECORDED BY PROVINCES AND MUNICIPALITIES

Year	Municipality	Province	Disease	Cases	Deaths
1906	Saint John	New Brunswick	Typhoid fever	40	3
1912	Winnipeg	Manitoba	Typhoid "	92	7
1913	Calgary	Alberta	Scarlet "	13	0
1916	Winnipeg	Manitoba	Typhoid "	23	0
1918	Quebec City	Quebec	Typhoid "	23	2
1919	Winnipeg	Manitoba	Scarlet "	73	0
1920	Regina	Saskatchewan	Typhoid "	83	0
1921	Montreal	Quebec	Typhoid "	5	0
1921	Vinelands	Ontario	Typhoid "	20	0
1922	Quebec City	Quebec	Typhoid "	14	3
1922	Montreal	Quebec	Typhoid "	33	3
1922	Winnipeg	Manitoba	Scarlet "	29	0
1922	Winnipeg	Manitoba	Scarlet "	10	0
1923	Saint John	New Brunswick	Typhoid "	10	0
1923	Sherbrooke	Quebec	Typhoid "	7	2
1923	Arnprior	Ontario	Typhoid "	6	0
1923	Hanover	Ontario	Typhoid "	46	4
1924	Montreal	Quebec	Typhoid "	16	2
1924	Quebec City	Quebec	Typhoid "	8	0
1924	Quebec City	Quebec	Paratyphoid fever	5	0
1925	Winnipeg	Manitoba	Scarlet fever	28	0
1925	Winnipeg	Manitoba	Typhoid "	9	2
1926	Winnipeg	Manitoba	Typhoid "	15	0
1927	Montreal	Quebec	Typhoid "	5002	533
1927	Chatham	Ontario	Typhoid "	109	7
1927	Quebec City	Quebec	Typhoid "	12	0
1928	Quebec City	Quebec	Typhoid "	20	4
1928	Dundas	Ontario	Typhoid "	13	0
1928	Timmins	Ontario	Typhoid "	10	0
1928	Sturgeon Falls	Ontario	Typhoid "	12	0
1929	Edmonton	Alberta	Scarlet "	28	0
1929	Ameliasburg	Ontario	Typhoid "	17	2
1930	Belleville	Ontario	Typhoid "	18	3
1930	Kirkland Lake	Ontario	Septic sore throat	457	4
1930	S. Westminster	British Columbia	Typhoid fever	14	1
1930	Montreal	Quebec	Typhoid "	130	26
1930	Montreal	Quebec	Typhoid "	96	12
1931	Kitchener	Ontario	Scarlet "	11	0
1931	St. Catharines	Ontario	Paratyphoid fever	487	3
1931	Surrey	British Columbia	Typhoid fever	14	1
1931	Hampton	New Brunswick	Typhoid "	7	0
1931	La Pérade	Quebec	Typhoid "	29	2
1931	Dauphin	Manitoba	Septic sore throat	100	0
1932	St. Maurice Valley	Quebec	Typhoid fever	527	45
1933	St. Catharines	Ontario	Paratyphoid fever	30	0
1933	Carman	Manitoba	Typhoid fever	15	1
1933	Port Elgin	Ontario	Septic sore throat	27	0
1933	Kingston	Ontario	Typhoid fever	19	0
1933	St. Eustache	Quebec	Typhoid "	27	2
1934	Moose Jaw	Saskatchewan	Undulant "	21	0
1934	Edmunston	New Brunswick	Typhoid "	12	0
1934-35	Shawinigan Falls	Quebec	Typhoid "	59	5
1935	Minnedosa	Manitoba	Undulant "	4	0
	Total			7935	688

EPIDEMICS ACCORDING TO DIAGNOSIS

	Epidemics	Cases	Deaths
Typhoid fever	38	6612	681
Paratyphoid fever	3	522	3
Scarlet fever	7	192	0
Septic sore throat	3	584	4
Undulant fever	2	25	0
	53	7935	688

Information concerning the extent to which pasteurization is being used is of such importance that the essential facts should be obtained in detail. It is obvious that if more adequate information is to be obtained, the Committee should prepare a form on which the details may be conveniently supplied. Unfortunately it has not been possible this year to prepare such a form. Further, this information should not be limited to the larger cities but should include reports from the smaller cities and the towns. Such a survey would reveal the very limited extent to which pasteurization is being used in the smaller urban communities.

Included in table II are the data concerning the percentage of dairy cows which have been tuberculin tested and the percentage tested for contagious abortion. In keeping with the widespread interest in tuberculosis control on the part of dairy farmers and cattle breeders and the establishment of restricted areas, there is a marked increase in the number of cities which obtain the greater part of their milk supply from tuberculin tested herds. In twenty cities 80 per cent. or more of the milk is obtained from such herds.

Through the co-operation of the provincial departments of health information was obtained concerning the approximate number of dairy cows in each of the provinces and an estimate of the percentage of dairy cows which have been tested for tuberculosis and contagious abortion. These data are presented in table III.

The honour roll of municipalities which have passed by-laws requiring all milk to be pasteurized includes the names of 44 towns and cities. They are as follows: Aurora, Ont.; Barrie, Ont.; Carleton Place, Ont.; Cochrane, Ont.; Conistan, Ont.; Drummondville, Que.; Dundas, Ont.; Dunnville, Ont.; Forest, Ont.; Fort Erie, Ont.; Forest Hill, Ont.; Galt, Ont.; Hamilton, Ont.; Iroquois Falls, Ont.; Kapuskasing, Ont.; Kerrobert, Sask.; Kingston, Ont.; Kirkland Lake, Ont.; Lachine, Que.; Leamington, Ont.; Leaside, Ont.; Meaford, Ont.; Montreal, Que.; Moosomin, Sask.; Newmarket, Ont.; Niagara Falls, Ont.; North Bay, Ont.; Orillia, Ont.; Oshawa, Ont.; Outremont, Que.; Port Colborne, Ont.; Richmond Hill, Ont.; St. Catharines, Ont.; St. Eustache, Que.; Saskatoon, Sask.; Simcoe, Ont.; Sudbury, Ont.; Timmins, Ont.; Toronto, Ont.; Verdun, Que.; Welland, Ont.; Westmount, Que.; Whitby, Ont.; and Windsor, Ont.

The correspondence with health departments in the gathering of the information presented in this survey contained frequent references to the difficulties which confront municipalities in obtaining the pasteurization of all milk offered for sale. It is evident from this report that very little progress is being made in achieving this objective in several cities. On the other hand, a number of cities record considerably larger quantities as being pasteurized. New and more effective regulations have been introduced in several provinces which will not only assure more efficient pasteurization but should definitely strengthen the health officer in his efforts to obtain pasteurization. It is evident that there must be no slackening of the efforts to create a strong public opinion based on an intelligent understanding of the value of milk and the necessity of pasteurization.

TABLE II

PASTEURIZATION AND TESTING OF CATTLE IN CITIES IN CANADA WITH OVER 20,000 POPULATION

City	Province	Population, 1931 census	Percentage of milk pasteurized	No. of pasteurizing plants	Percentage of dairy cows tuberculin tested	Percentage of dairy cows tested for contagious abortion
Montreal	Que.	818,577	95	28	100	10
Toronto	Ont.	631,207	100	55	75	25
Vancouver	B.C.	246,593	78	18	100	nil
Winnipeg	Man.	218,785	78	10	25	nil
Hamilton	Ont.	155,547	100	21	90	7
Quebec	Que.	130,594	50	6	100	nil
Ottawa	Ont.	126,872	99	14	100	23
Calgary	Alta.	83,761	78	4	100	nil
Edmonton	Alta.	79,197	79	6	100	nil
London	Ont.	71,148	86	17	14	14
Windsor	Ont.	63,103	100	11	...	..
Verdun	Que.	60,745	98	..	100	100
Halifax	N.S.	59,275	80	8	80	10
Regina	Sask.	53,209	98	7	100	nil
Saint John	N.B.	47,514	90	7	100	nil
Saskatoon	Sask.	43,291	100	4	100	nil
Victoria	B.C.	39,082	33	4	100	nil
Three Rivers	Que.	35,450	53	..	..	..
Kitchener	Ont.	30,793	97	10	50	nil
Brantford	Ont.	30,107	97	7	51	..
Sherbrooke	Que.	28,933	25	1	100	nil
Ft. William	Ont.	26,277	85	7	30	15
St. Catharines	Ont.	24,753	100	8	98	30
Westmount	Que.	24,235	98	2	100	80
Kingston	Ont.	23,439	..	..	..	..
Oshawa	Ont.	23,439	100	5	74	18
Sydney	N.S.	23,089	17	3	7	nil
Sault Ste. Marie	Ont.	23,082	75	4	100	25
Peterborough	Ont.	22,327	70	5	50	50
Moose Jaw	Sask.	21,299	89	3	100	5
Guelph	Ont.	21,075	68	4	100	12
Glace Bay	N.S.	20,706	16	1	5	nil
Moncton	N.B.	20,689	20	2	100	nil

TABLE III

Name of Province	Approximate no. of dairy cows	Estimated percentage of dairy cows tested for		No. of municipalities with compulsory pasteurization
		Tuberculosis	Infectious bovine abortion	
Prince Edward Island	47,000	100%	not available	none
Nova Scotia	117,000	....	1.7%	none
New Brunswick	236,000	70%	1%	none
Quebec	970,000	55%	1%	seven
Ontario	1,176,000	not available	not available	thirty-five
Manitoba	330,000	20%	1%	none
Saskatchewan	553,000	27%	3%	three
Alberta	470,000	9%	2%	none
British Columbia	110,000	55%	1%	none

IMPORTANT LEGISLATION IN ONTARIO

It is of interest to note that Regulations passed pursuant to The Milk Control Act of Ontario have been effective since September, 1936. These Regulations are designed to set up appropriate standards in respect to the treatment and distribution of both raw and pasteurized milk. The responsibility of their administration is largely placed on the appropriate Division of the Department of Health for the province. The licensing of those who distribute milk for profit is an obligation of the Milk Control Board, a Commission answerable to the Minister of Agriculture. The granting of such licence, however, is to all intents and purposes dependent on a favourable report as to the type of plant and equipment, method of processing and qualifications of the operator, which is received from the Department of Health. All but a few distributors have readily accepted the requirements of the Regulations.

The Committee has given some thought to the matter of the distribution of fruit beverages by milk dealers. While there was a feeling that this invasion of another beverage field was unwarranted, it was finally decided to consider measures designed to control any possible health hazards resulting from the operation of such a plant and leave the matter of ethics to those more competent to pass final judgment. The following regulations are suggested:

"No product other than milk products and products of which milk is a substantial component shall be handled or processed in a (raw) milk plant except where completely separate equipment is used and where the processing is carried on in a separate room."

"No products other than milk products and products of which milk is a substantial component shall be handled or processed in a pasteurization plant unless equipment entirely separate from equipment used in pasteurization is used and the handling or processing is carried on in a separate room."

Through sub-committees appointed by the appropriate Sections of the Association, the Committee plans to present the latest authoritative data on the production and distribution of safe milk. The Committee of the Laboratory Section is studying the present standard methods for laboratory examination of milk and has arranged for studies of the phosphatase test, which would appear to be of value in the control of the pasteurizing process, in three laboratories. A report of an intensive study in the School of Hygiene, University of Toronto, is being presented at the Laboratory Section meeting during the sessions of this convention by Dr. M. Doreen Smith. Through the Section of Public Health Engineering detailed information is being collated regarding the minimum requirements for efficient pasteurization and the Section of Vital Statistics and Epidemiology is gathering essential data regarding the extent of pasteurization and the occurrence of milk-borne epidemics. The Committee has also a sub-committee on legislation, recording changes in provincial and municipal enactments and defining the essential requirements to meet the needs for the adequate safeguarding of milk.

A. E. BERRY, *Secretary.*

REPORTS OF THE COMMITTEES OF THE LABORATORY SECTION

1. THE COMMITTEE ON STANDARD METHODS

DURING recent months, since the publication of the eighth edition of "Standard Methods for the Examination of Water and Sewage", published by the American Public Health Association and the American Water Works Association, the Committee has been giving consideration to the methods presented in order that at the next Christmas meeting of the Section, to be held in December 1937, definite action may be taken. At the last annual meeting, the recommendation of the Laboratory Section was approved; namely, that the Standard Methods of the American Public Health Association and the American Water Works Association be temporarily adopted as official standards by the Canadian Public Health Association. The opportunity is now being given to consider recommendations regarding optional methods as may be suggested. The eighth edition, together with recommended alternate methods, will, when approved by the Association, constitute the Standard Methods of this Association.

In reference to standard methods for milk and dairy products, the same procedure is being recommended as relates to the examination of water and sewage; namely, the temporary approval of the Standard Methods of Milk Analysis as published by the American Public Health Association's Committee on Standard Methods.

Dr. Ambrose Moffat, as Chairman of the Committee on Milk Methods, has been conducting studies and, it is expected, will make recommendations at the Christmas meeting of the Laboratory Section.

N. J. HOWARD, *Chairman.*

2. REPORT TO THE CANADIAN INSTITUTE OF CHEMISTRY AND THE LABORATORY SECTION OF THE CANADIAN PUBLIC HEALTH ASSOCIATION BY THE COMMITTEE ON CHEMICAL METHODS OF WATER ANALYSIS

SINCE our report of December last this committee has held one meeting. It was intimated in that report that our committee had been given good reason to expect to be accorded representation on the Joint Editorial Committee of the American Public Health Association and the American Water Works Association and in the meantime we have been officially notified that this privilege has granted. Accordingly, Mr. H. A. Leverin was chosen to represent us and he will attend the first meeting of that committee on June 8th, at which time he plans to submit for their information a brief record of our activities as outlined in the attached statement.

As indicated in it, our committee is active in the consideration of three problems in water analysis, namely, determination of soap consuming power, iron and cyanide. The committee wishes to express appreciation of the efforts

of the National Research Council in connection with the first named and hopes that they will continue the work.

In a former report it was stated that this committee favoured the adoption by the Canadian Institute of Chemistry and the Canadian Public Health Association of the chemical methods of water analysis as contained in Standard Methods of the American Public Health Association and the American Water Works Association, provided we were permitted to co-operate in the preparation of such chemical methods and to have a voice in their final adoption.

The inclusion of a Canadian chemist on the Joint Editorial Board would seem to have satisfied this condition and therefore this committee now feels free to recommend to the Canadian Institute of Chemistry and to the Canadian Public Health Association that each body consider the advisability of taking the necessary action to cause the chemical methods as outlined in the Standard Methods of Water Analysis of the American Public Health Association and the American Water Works Association to become official for that body.

If action is taken to carry out the recommendation just referred to, then one of the main functions for which this committee was appointed will have been accomplished. However, it would seem to be desirable to have a standing committee to direct the experimental work being conducted in Canada, to approve all recommendations to the Joint Editorial Board and to appoint the committee representative on that Board. It is, therefore, recommended that action be taken to appoint either the present committee or another one as a standing committee to carry out this work.

A. R. BONHAM, *Chairman*; A. V. DELAPORTE, A. F. GILL, F. G. GREEN, M. H. MCCRADY, and W. E. PATTERSON.

Activities of the Committee on Water Analysis of the Canadian Institute of Chemistry and the Canadian Public Health Association

THIS committee is a joint one of the Canadian Institute of Chemistry and the Canadian Public Health Association, appointed to investigate chemical methods of water analysis and methods of reporting them.

Evidence of the need of such an investigation was shown by a questionnaire which the National Research Council sent in 1932 to all cities and towns in Canada with over 5,000 inhabitants, asking information in regard to their water supplies. When this information came in, it was immediately apparent that it would be impossible to tabulate it in any satisfactory manner as the data were presented in almost every conceivable form.

Following the preparation of this report, Mr. H. A. Leverin of the Bureau of Mines, Mines and Resources Department, Ottawa, went into the question still further and found the situation so generally confusing that, in 1934, he presented a paper outlining his views at the Canadian Chemical Convention.

As a result of this paper, the Convention appointed a small committee to give the matter further study.

About the same time, the Canadian Public Health Association also found

the situation far from satisfactory and appointed a committee to study it. In 1935 a joint committee was formed and since that time a few additional members have been added. The committee is working in the following three fields:

1. Standardization of methods of water analysis.
2. Standardization of methods of reporting water analysis.
3. Classification of Canadian fresh waters.

Considering the methods of water analysis (and with this might as well be included methods of reporting), it is the general belief that the same standards should, if at all possible, obtain both for the United States and Canada.

There is only one important difference in our system of measures. In Canada the Imperial gallon is the legal standard. There is the further additional handicap, however, that some industries developed in the United States and later establishing a branch in Canada, may use the United States gallon in their processing. To report analysis, therefore, in "grains per gallon" causes immediate difficulty even if the gallon is specified. We therefore strongly advocate the "parts per million" system.

As to methods of analysis, it has been recommended and tentatively agreed that the committee report that the methods outlined in the Eighth Edition, or current revision thereof, Standard Methods of Water Analyses of the American Public Health Association and American Water Works Association be adopted. (Noting, however, that the A.S.T.M. is now attacking the problems of boiler water, in particular, on a comprehensive basis, it has been suggested that the way be left open for minor modifications in the method of reporting should any improvements later be introduced in the United States.)

In addition to this, three methods of analysis are being studied by members of the Committee:

(1) Cyanide Determination: This is of importance in Northern Canada in view of the tendency toward pollution of potable water supplies by tailings from gold mills. Owing to its toxicity to fish in extremely small amounts, it is also of interest to the fisheries authorities.

(2) Soap-Consuming Power: In view of the various compositions of "castile" soap it seems desirable that a compound of definite chemical composition be used in the preparation of the standard soap solution.

(3) Determination of Iron: It has been reported that the three methods detailed in the American Public Health Association manual do not give concordant results for an iron content in excess of 0.5 p.p.m., and it is being given consideration although the method detailed in paragraph 2-1, page 74, A.P.H.A. Methods 8th ed., is tentatively adopted.

As to methods of reporting, our Canadian committee presently favours that all components be reported in terms of the acid or basic radicals concerned except in the case of dissolved gases, which would be reported in parts per million on the uncombined basis. The present tentative scheme for reporting is as follows:

Analysis in Parts per Million

Total dissolved solids
Suspended solids
Loss on ignition
Silica (SiO_2)
Iron (Fe) in unfiltered sample
Iron (Fe) in filtered sample
Aluminium (Al)
Calcium (Ca)
Magnesium (Mg)
Potassium and sodium (K—Na)
Sulphate (SO_4)
Total chloride (Cl)
Free chlorine (Cl)
Nitrate (NO_3)
Carbonate (CO_3)
Free carbon dioxide (CO_2)
Bicarbonate (HCO_3)

Carbonate hardness* (calculated, as $CaCO_3$)
Total hardness* (calculated, as $CaCO_3$)
Soap consuming power (as $CaCO_3$)
Alkalinity or acidity (as $CaCO_3$)
Nitrogen (N) as
1. Free ammonia
2. Albuminoid ammonia
3. Nitrites
4. Nitrates
Oxygen consumed (O)
Dissolved oxygen (O)
Colour
Turbidity
Odour, cold
hot
pH
Temperature °C.

*Calcium and magnesium hardness may, if desired, be reported separately as $CaCO_3$ and $MgCO_3$, respectively.

A. R. BONHAM, *Chairman.*

3. THE COMMITTEE ON PUBLICATIONS

A SERIES of papers was reviewed by the Committee during the past year and returned to the Editorial Board with a summary of the Committee's recommendations. The primary purpose of the Committee is to be of assistance to the Editorial Board in considering laboratory papers, which frequently are of a highly technical character. All papers recommended by the Committee have been published and the Committee has been asked by the Editorial Board to continue its work.

Following the suggestions made in last year's report, the Editorial Board has published rules for the guidance of contributors of articles. It is hoped sincerely that the suggestions made will be observed by contributors, as much work could be saved in the editorial preparation of articles if more care was taken in their preparation.

I wish to express my thanks to my colleagues on the Committee, Dr. James Craigie and Dr. William D. Hay, for their hearty co-operation.

A. J. SLACK, *Chairman.*

4. THE COMMITTEE ON THE DIRECTORY OF LABORATORY PERSONNEL

THE third edition of the directory of laboratory personnel, including those engaged in bacteriology, pathology and public health chemistry, was issued in May. The directory is of increasing value and gradually will become recognized as authoritative. Its preparation requires a large amount of corre-

spondence and the Committee is pleased that the information requested has been promptly supplied.

In addition to its value to the Section, the directory is helpful to those who are conducting laboratory work, permitting of the sending of reprints and the making of enquiries when desired.

J. H. ORR, *Chairman.*

5. THE COMMITTEE ON NEW LABORATORY PROCEDURES

ON the occasion of the Christmas meeting of the Laboratory Section last December, the second bulletin of the Section was distributed. The bulletin deals with new laboratory procedures for which there are no standard methods and which, after thorough trial arranged by the Section, are recommended for use. Interest in this publication is evidenced by the requests for additional copies. The publication included: Diagnosis of Whooping Cough, The Complement-Fixation Test in Variola, and Culture Medium for Entamoeba Histolytica. The number of methods presented will vary from year to year, depending on the introduction of new procedures.

F. O. WISHART, *Chairman.*

6. THE COMMITTEE ON THE CLASSIFICATION OF SALMONELLA

ACTIVE work has been conducted by the Committee during the past year in the collection and study of Salmonella strains from the provinces of Ontario, Quebec, Alberta, and British Columbia. A few strains were also received from other provinces and it is anticipated that during the coming year a larger number of strains will be received.

The Committee consists of representatives of the provincial and municipal laboratories throughout Canada and the laboratory work is being conducted in the School of Hygiene, University of Toronto, through the co-operation of Dr. D. T. Fraser and Dr. J. Craigie and in the University of British Columbia under the direction of Dr. C. E. Dolman with the assistance of Dr. K. F. Brandon. The following are also members of the Committee: Dr. R. A. H. Mackeen, Saint John; Dr. D. J. MacKenzie, Halifax; Mr. M. H. McCrady, Montreal; Dr. A. L. MacNabb, Toronto; Dr. F. T. Cadham, Winnipeg; Dr. Francis McGill, Regina; and Dr. Allan Coats Rankin, Edmonton.

The preliminary work of the Committee indicates that the subject of study is of great practical importance as well as of academic interest. There is an urgent need for the establishing of similar studies in other countries and also of a central body in order to prevent the confusion which is arising due to multiplicity of types and the lack of standards.

M. H. BROWN, *Chairman.*

BOOKS AND REPORTS

Nutritional Factors in Disease. *W. R. Fearon. William Heinemann (Medical Books) Ltd., London, 1936. Published in Canada by The Macmillan Company of Canada Limited, 70 Bond Street, Toronto. 141 pages with index. $2.25.*

THIS volume is a revision of an essay for which was awarded the Buckston Browne Prize for 1935 by the Harveian Society of London. It is divided into five sections, dealing with the following subjects: a general discussion of nutrition, nutritional factors in disease, inorganic foodstuffs occurring in relatively great amounts in foods, inorganic micro-constituents like iron and iodine, and the vitamins. The arrangement is somewhat unusual and there are a number of unorthodox definitions which are of doubtful value. It is refreshing, however, to find in a book on nutrition that the subject matter is handled unconventionally without destroying scientific value. The major portion of the book is, of course, devoted to diseases of dietetic origin and their treatment, and the author is to be heartily commended for his ability to discuss these matters in a brief space. The discussion of diabetes mellitus is begun by considering it as a saccharosis but the author wisely states that this is by no means proved and may not be correct. The section on the vitamins is short but accurate. So far as the reviewer is aware, this is the first book on nutrition which points out the nutritional significance of choline. The book should not be recommended to readers who may wish to secure exact menus for the treatment of any disease but it can be commended as a brief, readable, and accurate account of the nutritional science which makes possible the dietetic treatment of disease.

E. W. McHenry

Bulletin of the Health Organisation, League of Nations, Volume VI, No. 2, April 1937. *League of Nations Society in Canada, 124 Wellington Street, Ottawa; 43 St. George Street, Toronto; Sun Life Building, Montreal. Annual subscription, $2.50. Single number, 65 cents. 298 pages.*

THE APRIL issue of the QUARTERLY BULLETIN OF THE HEALTH ORGANISATION is featured by two further reports on nutrition. The first of these embodies the work of the experts appointed to study methods of assessing the state of nutrition in infants and adolescents. This report is of great interest particularly in view of the fact that in recent years the great need for a convenient and reliable yardstick for assessing the state of nutrition has been realized.

The efforts and work of the Health Organisation in nutrition since 1930 have produced a volume of evidence of far-reaching significance to public health and to civilization. This present contribution indicates the recommendations made by the experts and discusses in some detail the known methods of assessing the state of nutrition in relation to defective diet. The extensive bibliography will be useful to those who wish to pursue the subject further.

The second paper on nutrition outlines in simple terms the nutritional requirements of the normal child, including caloric, protein, vitamin and iron requirements.

Other articles in this number of the *Quarterly* deal with the prophylaxis and vaccination in typhus fever, the serum diagnosis of enteric fever, and the prevention of malaria by quinine and atebrin.

A. H. Sellers

CURRENT HEALTH LITERATURE

These abstracts are intended to direct attention to articles that have appeared in other journals during the past month. Any of the journals referred to may be borrowed for three days or longer if desired. Address requests to the secretary of the Editorial Board.

Salient Public Health Features of Rheumatic Heart Disease

IN this article, from the Office of Heart Disease Investigation, U.S. Public Health Service, the definition, recognition, epidemiology and control of rheumatic infection are discussed.

Attention is given to the management of the rheumatic case, the subsequent regulation of his mode of living to fit the cardiac reserve and, most importantly, the prevention of recurrent attacks. Tonsillectomy is looked on with some favour both in respect to incidence and mortality. Surveys of school children show that 0.5 to 4.0 per cent. are affected with rheumatic heart disease. Special schools for these cases, however, are not recommended.

Reduction in incidence of the disease appears to depend largely upon betterment of living conditions.

O. F. Hedley, Pub. Health Rep., 1937, *52*: 164.

Factors Responsible for Failure Further to Reduce Infant Mortality

ACCORDING to infant mortality statistics for the United States, the reduction in the number of deaths in the group under 14 days of age has been small as compared with that for the first year as a whole. In order to determine accurately the chief causes of death in this neonatal group, it was found necessary to secure data from necropsies by competent pathologists, medical certification and present methods of classification of stated causes of infant deaths being in the opinion of the authors unsatisfactory and misleading. A series of 645 satisfactory necropsies was obtained in Chicago and cerebral haemorrhage and prematurity were found to be the two most important conditions in neonatal mortality.

Herman K. Bundesen, William I. Fishbein, O. A. Dahms and Edith L. Potter, *J.A.M.A.*, 1937, *108*: 337.

The Chemical Prophylaxis for Poliomyelitis. The Technique of Applying Zinc Sulphate Intranasally

FOLLOWING the demonstration by Schultz and Gebhardt (*J.A.M.A.*, 1937, **108**: 2182) that a zinc sulphate spray protected monkeys against intranasal instillations of poliomyelitis virus, the present authors carefully studied its application for human trial. For such use they recommend a one per cent. solution of zinc sulphate containing one per cent. pontocaine hydrochloride and 0.5 per cent. sodium chloride. One-cc. quantities are sprayed directly on the olfactory area of each nostril on each of three successive days and then single sprays at intervals of two weeks. In order to reach the area of the cribriform plate a special spray tip is required and the procedure should be carried out by a trained personnel.

Max M. Peet, Dean H. Echols and Harry J. Pichter, *J.A.M.A.*, 1937, *108*: 2184.

Studies on Trichinosis. III. The Complex Clinical Picture of Trichinosis and the Diagnosis of the Disease

THAT trichinosis is a major public health problem in the United States is amply evidenced by an autopsy incidence of 12.5 per cent. on examination of 1,778 cadavers at 24 hospitals in 11 places in that country. Out of 222 positive cases none were diagnosed clinically.

The difficulties in diagnosis are due to its prevalence being unrecognized and to its extremely varied clinical picture. The protean manifestations of the disease are determined by the number of worms present, the tissues invaded, the size of the patient, and his physical condition. Diagnostic laboratory aids are discussed and the need for research and co-operation by clinicians, pathologists and parasitologists is stressed.

Maurice C. Hall, *Pub. Health Rep.*, 1937, *52*: 539.